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### Double-Acting Plunger Pump.

A STEAM pump for mining purposes must fulfil so many different requirements, that those of ordinary modes of construction, though performing admirably above ground, are of little use. The water to be lifted varies greatly in character. In some cases so large a proportion of sand is present that great heaps accumulate at the outlet. Mine waters often contain acids which quickly destroy the iron in contact with them. We have seen instances where the waters were so thick that the stream would break from the discharge pipes almost like a stream of mud rather than water. The pump which we illustrate this week owes its very peculiar form to the fact that it was designed for a mining pump that should fulfil all the requirements made upon it.

The displacement or plunger system was adopted because it is the only one which allows all leakages to be made external. To do this, however, and make the pump double acting, it was cut into two parts and the ends separated by means of a fixed stuffing-box. In other words, there are two single-acting pump cylinders, with one plunger between them. This allows easy access to the stuffing-boxes upon their inner ends, and brings all leaks to the outside, where they can be seen. At the same time, the loosening of a few nuts holding the followers in place allows easy access to the main packing box, which, if necessary, may be repacked in a few minutes. Fibrous packing is generally used in the place of metallic, on account of the ease with which it is replaced, and the small wear occasioned by sand, dirt, etc. The plunger has a clearance in the cylinder, so that sand and gravel will not wear either plunger or cylinder itself.

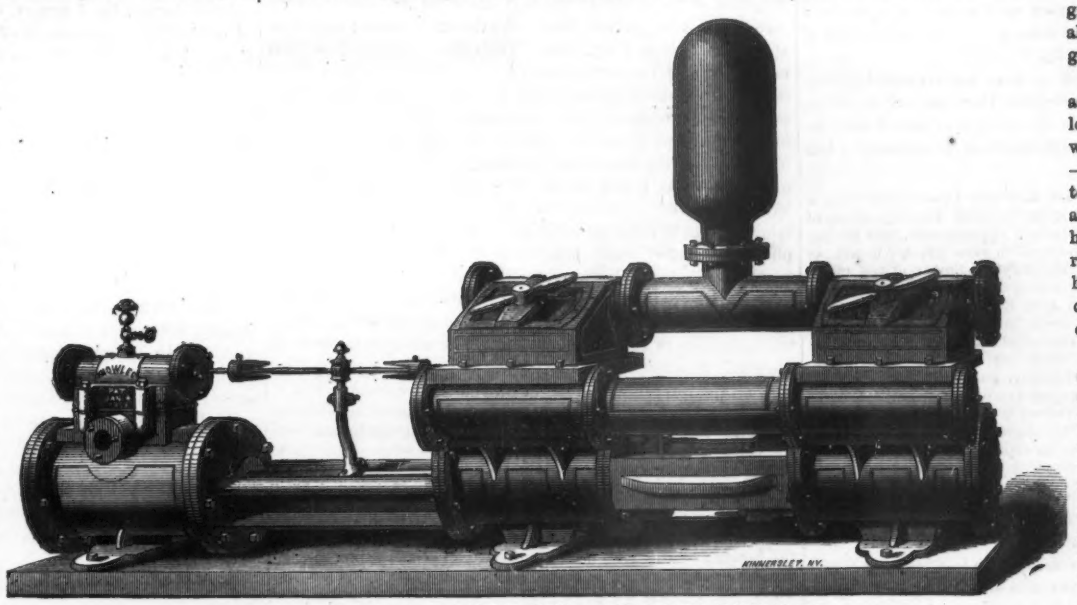
Each end of the cylinder, or rather of the single cylinders, has its own valve chest. These valves have an opening area equal to that of the plunger. These valves are separated from the cylinder by a little more than the thickness of the walls, thus reducing the length of the passages to the minimum.

These chests are connected by pipes of large size (the internal diameter being equal to the diameter of plunger), upon one of which the air chamber is situated. The position of the air chamber is optional, as it may be placed at the end of either valve chest, as the case may require. The position of the discharge pipe may be varied in same way, as well as the suction, which is no small advantage where room is limited. Upon the top of the valve-chests hand-plates are arranged, so that easy access may be had to the valves, and that without the use of any tools whatever, simply by unscrewing the hand-lever nuts. The valves themselves are seated upon oak-tanned leather. The hinges are of metal.

The steam cylinder is of the usual pattern, built by Messrs. KNOWLES & SIBLEY, who are the makers of the pump we describe. The main valve is a plain, flat, slide valve, of the "B" pattern, and above this in a separate cylinder is the auxiliary or driving-valve which drives the main side valve. The arm upon the main piston rod merely opens the steam connection with the small steam cylinder. This makes its stroke and moves the main valve. This motion is positive, and will work, even though under a head of water instead of steam, with cylinder and passages also filled with water. There is no danger of the motion injuring itself, as it is cushioned by steam at each end of the cylinder, and remains quiet through the whole length of the stroke until the moment for changing the valve. This positive motion is of great value, as a case in point will show. We are informed that by a sudden flood a mine containing one of these pumps was drowned out, and the pump submerged to a depth of 86 feet. It was at first proposed to grapple for the pump (at the bottom of a shaft) and hoist it up, breaking the connections, when it was suggested that it would be well to turn on steam and see whether it would work. After some little discussion it was determined to do so, and steam at 80 pounds to the inch was turned on. After a little, the pump began to work, and continued to do so until the mine was clear. In another case, instead of floating the pump upon a raft, and allowing it to pump out a shaft, flexible connections were made, and the pump lowered to the bottom. This was in a coal mine, where fuel was of no account compared with time and labor.

In case of wear or accidental breakage of any part of a pump, an order by telegraph or mail will bring a new part by first express, as ALL THE PARTS ARE MADE TO INTERCHANGE AND FIT, that but little time need ever be lost by a break-down.

The manufacturers have recently removed from their old quarters, and are now established at 90-92 Liberty street. They have now at their place of business two very handsome specimens of these pumps. We also noticed a large pump for a coal mine, of the ordinary pattern (the water being free from dirt), did not require special arrangement of parts, but as there is a large amount of free sulphuric acid present, all parts of the pump coming in contact with the water were made of bronze or gun-metal. This is done in all cases where the water is at all corrosive in its nature.



*DOUBLE-ACTING PLUNGER PUMP FOR MINING PURPOSES.*

### The Peteler Portable Railroad.

MOST contractors must have heard of this invention, though many have never seen it; but it has been used for a year or two in this country—quite extensively in the East—and its value and the extent to which it is applicable have been pretty thoroughly established. The patent for the Northwest has been owned by a contractor, who heretofore has used it in his own business, but has not manufactured under it or offered it to contractors. Lately, however, he has been preparing to organize a company in Chicago for the manufacture and sale of track and cars in the Northwest, and, in order to exhibit the working of the system, has had a section of track and ten cars put into use on the improvement of S. J. WALKER'S property on the South Branch, near the corner of Twenty-second and Reuben streets, and close to the new bridge building yard of WELLS, FRENCH & Co.

The object of this portable railroad is to lessen the cost of transportation of earth, gravel, etc., on cuts and fills of railroads, and wherever such material is to be moved. It is evident enough, of course, that the same power will move a much larger load on a rail track than on an ordinary surface, and the problem consisted in contriving a sufficiently cheap and portable track, and a car adapted to such track and easily loaded and unloaded.

The track used here is formed of separate sections, twenty-three feet long. Each section consists of two three by six inch sleepers, twenty-five feet long, placed two feet apart, and held together by four bolts of one inch iron. Close to the inner edge of the upper surface of each sleeper is riveted a rail of half oval iron about one and a half inches wide and half an inch high. These form a track of twenty inch gauge, the framework being equivalent to the road-bed and ties of an ordinary railroad. This section supplies a complete railroad twenty-five feet long. To make a longer line, the sections are placed on the surface of the ground end to end, and fastened together by hooks and eyes, dowel joints, or otherwise. In the road at Bridgeport there are castings at the ends of the sleepers, those at one end forming a mortise and those at the other a species of tenon with a hook, so that the two adjoining sections are simply slipped together and are then latched. These sections can be readily handled, loaded and unloaded by three or four men, and four men can lay one thousand feet in an hour. A few curved sections and one section with a frog and switch are needed with every lot. The track can thus be laid on almost any surface—on rough ground or in marshes—and a good road thus provided for vehicles.

These vehicles have iron flanged wheels twelve or fourteen inches in diameter supporting a framework on which swings a hopper-like box, which can be turned over to either side. The sides are hinged at the top, and when the box is turned upon one side that side falls, thus leaving it a box without a bottom, and the load is dumped. The cars are made to carry a cubic yard of earth, and they weigh about 350 pounds. Their sides are moderately low, so that they can be easily loaded. They are coupled together by chains and hooks.

At Bridgeport, the earth to be moved is dredged from the slips and emptied in heaps on the bank. At the bank there are two tracks for a few sections, one being a side track. The cars are run in trains of five, hauled by one horse. When one train is loaded the other is drawn up to the bank on the other track and left there while the horse is hitched to the loaded train and draws it to the low ground which is to be filled, where the cars are dumped one by one on the unfilled side of the track. When the ground parallel to the track has been filled a few feet, the track is moved upon the newly-made ground, so that the earth is always dumped on the low ground where it is wanted.

Thus we have here one man and one horse hauling five such loads as usually require a man with a pair of horses for each—that is, a man and one horse to do what, without the portable railroad, five men and ten horses do. It is common on railroad work to use a pair of horses and 12 trains of twelve cars, by which a still greater economy is secured.

The portable track is sold in sections, ready for use, at one dollar per running foot, and the cars at eighty dollars each. At these rates, which are abundantly profitable to the manufacturer, it is claimed that any contractor can save their cost in three or four months of work. That there must be a large saving is unquestionable, and contractors can very readily estimate what it will be on inspection. The railroad may be seen in operation at the place named above, for a short time, and engineers and contractors will find it worth their while to examine it. Its portability, adaptability to different surfaces and circumstances, its economy and its simplicity, are evident.—*Chicago R. R. Gazette.*

### Formation of Native Azurite (Blue Carbonate of Copper).

F. WIBEL and E. TUNGEL have tested large quantities (25 grms.) of the Siberian mineral for ammonia, in order to see whether the intense blue color exhibited by azurite may be due to the presence of an ammoniacal compound of copper. The result of repeated experiments in this direction were negative; but, when a solution of sulphate of copper is heated along with lumps of white marble to 200° in a sealed tube, and the green carbonate of copper thus formed left in the tube for several months, the authors observed the formation of an intensely blue-colored carbonate; while, at the same time, all the water in the tube (although yet sealed) had disappeared, crystals of gypsum being simultaneously deposited. The difficulty of properly separating from each other the two carbonates (green and blue) prevented the making of an analysis, but the surmise is that azurite is formed from malachite by absorption of carbonic acid and loss of water.—*The Chemical News.*

THE OLDEST LOCOMOTIVE ENGINEER IN GREAT BRITAIN.—JOHN MANN, an engineer in the employment of the Caledonian Railway Company, died at his house, Motherwell, on the morning of the 12th inst. He was the first locomotive engine-driver in Scotland, having come from the North of England to drive the first engine on the old Monkland and Kirkintilloch Railway about thirty-seven years ago. It is further said that he was the oldest driver in the world.—*The Engineer.*

## Polytechnic Club of the American Institute.

Meeting held at the rooms of the Association May 11, 1871. The President (Prof. S. D. TILLMAN) in the chair.

THE PRESIDENT (Prof. S. D. TILLMAN), read the following items of scientific news:

I. SULPHUR MINE.—The lands of the American Sulphur Mining Company are located in the Parish of Calcasieu, in the southwestern part of the State of Louisiana, comprising four hundred acres immediately adjoining the lands of the Calcasieu Sulphur Mining Company of Louisiana, who have penetrated the sulphur upwards of *one hundred feet* at from 428 to 446 feet below the surface, disclosing a fine quality of crystallized sulphur, which by analysis is shown to be from 70 to 96½ per cent. pure—a supply and purity unheard of in the world's history, more than sufficient to meet the demands of commerce for centuries to come, and 350 feet nearer the surface than in Central Italy, where they go 800 feet.

While all other mines heretofore discovered yield scarcely 30 per cent. of sulphur from the ore, which would be refined by sublimation at a heavy cost, the Sulphur mines of Louisiana have the advantage of yielding sulphur nearly chemically pure in a crystallized form, and which can be mined in any desired amount as easily as coal, which in the mines of Illinois is now being mined at a depth of 500 feet, and sold at the mouth of the shaft at $3 00 per ton.

The average cost of transportation of Sulphur from Sicily to the United States is about $7 00 per ton, and allowing the cost of raising the sulphur of Louisiana to the surface to amount to $5 00 per ton, the total cost of placing it in market, either foreign or domestic, could not therefore exceed $12 00 per ton. It is plainly to be seen that the State of Louisiana may furnish the markets of the world at a price so low as to suppress its production elsewhere and yet receive a vast profit. The sulphur, purer than that of commerce and in untold abundance, exists in the State of Louisiana, and the world demands it for the arts and agriculture.

This statement was followed by extracts from the report of MR. GRANET, chief engineer of the Calcasieu Sulphur and Mining Company, which has already appeared in our columns.

DR. VAN DER WEYDE: When I was in New Orleans a year ago last winter, I saw some of that sulphur. To my mind it is very doubtful if it will pay. We must take into account that it is found four hundred feet under water. We may bore for oil, or petroleum, or for salt that can be brought up in solution; but I do not believe that sulphur can be got out at a price to compete with the Italian sulphur. For sulphuric acid iron pyrites are used now instead of sulphur.

THE PRESIDENT: The point suggested is very important. Two years ago we had specimens of lignite presented from New Jersey, not more than thirty-five miles from this city; but it turned out that it was under a bed of sand, and that it would cost more to dig it out and brace up the sand with timbers than the lignite was worth. In mining coal, where the roof is of rock, there is not this difficulty.

DR. VAN DER WEYDE: In mining there are thousands of instances of this kind. In Philadelphia, there is gold in all the clay and all their bricks; but it will not pay to take it out. So there are millions of dollars' worth of silver in sea-water; but it will not pay to take it out.

II. IMPROVED MICROSCOPE.—Dr. ROYSTON PIGOTT has made a series of investigations which seem to show that objectives of high power sometimes give distorted appearances, and he has been led to employ lower powers which give greater clearness of detail, and to increase the magnifying power at the other end of the microscope, that is, the eye-piece. With an objective as high as a fifth, or even less, he uses a very deep eye-piece, and to correct residuary aberrations of the objective, and at the same time amplify, he introduces an important adjustable combination between the eye-piece and the object glass. He claims to obtain greater excellency, and with less cost than can be reached by using very expensive high powers. A careful comparison of his instrument with the best American and European microscopes should be made by a competent committee, and the result of the test be reported to the Microscropical Society.

DR. VAN DER WEYDE: Whatever you can see with a weak eye-piece, in a microcope, may be magnified by a stronger eye-piece but you cannot see any more.

Prof. JOHN PHINN: The test employed in this case was forming convex mirrors from small globules of mercury, and magnifying the image. But there are tests so much more severe than this, that this test is really worthless. I consider the old plan of magnifying by the eye-piece perfectly useless.

III. THE BAT'S WING.—Dr. JOSEPH SCHÖBL, of Prague, has recently repeated the experiments of SPALLANZANI who, long ago, discovered that bats which had their eyes put out were able, nevertheless, when allowed to fly about in a room, to avoid threads stretched across it. This faculty SPALLANZANI attributed to some highly developed sense of touch possessed by the wing. SCHÖBL covered the eyes of bats with sticking-plaster, and after assuring himself that the bats were guided by some other sense than sight, made a careful examination of the structure of their wings. His researches have led him to ascribe the phenomena to the power of peculiar nerve-endings in the wing. Of the five layers of nerves, two are connected with the Malpighian layer of the skin. To one of these, which is united with every fine hair found on the upper and under surface of the wing, he attributes a highly exalted sense of touch, and to the other the appreciation of temperature, pain etc. Dr. SCHÖBL believes he has discovered similar nerve-endings in peculiarly sensitive parts of other mammals, an account of which will soon be published.

Prof. PHINN: A curious experiment of my own in the central part of this State may be worth repeating. I was out fishing with flies. Bats were quite numerous, and I wanted one for the purpose of examining his wing under the microscope. I expected, if I caught them with flies, to catch them by the mouth. I caught five, and every one was caught by the tip of the wing. This would indicate that the bat makes a peculiar use of his wing in procuring his food.

DR. VAN DER WEYDE: Comparative anatomy proves that the wing of the bat is built after the plan of the hand; and it is probably used as a hand in catching its food.

Prof. PHINN: In angling for swallows in Italy, where it is a common sport, they are caught with the mouth.

THE PRESIDENT: It may turn out that the bat has some new sense governed by electrical forces. Before he comes to a thread he receives a warning, and turns out of the way. What sort of warning is that?

DR. RICHARDS: I have seen a blind man who would never run against a post. So acute was his sense of touch that on the approach of a solid body he would perceive it. It may be that the bat, instead of a new sense, has merely an exaltation of the senses that are common to other animals.

Prof. PHINN: I knew a blind man who could steer clear of objects by his keen sense of sound.

DR. RICHARDS: That is another instance of the exaltation of a common sense.

THE PRESIDENT: That would not explain the case of the bat; for sound would not be echoed from a fine thread.

IV. PRINTING CHRONOGRAPH.—The PRESIDENT remarked that during the last month he visited Professor G. W. HOUGH, at the Dudley Observatory at Albany, N. Y., who exhibited and explained his new printing chronograph—an automatic apparatus destined to work an entire revolution in the manner of recording astronomical observations where the utmost accuracy of time is of the highest importance. The inventor has successfully solved one of the most difficult problems, that of recording, by means of electricity, divisions of time as minute as the hundredth part of one second without sensibly affecting the regularity of the clock movements. It will be remembered that Professor HOUGH is also the inventor of a self-registering barometer and thermometer, which expresses in figures the changes in the pressure and temperature of the atmosphere as often as every five minutes, if required; the total number of changes during twenty-four hours being recorded on the same sheet, thus forming an annual volume of 365 leaves, in which the errors of eye and hand, necessarily made in recording personal observations, are avoided. All these devices are of the highest order of merit. A complete description of the automatic barometer will be found in the American Institute Transactions for 1865.

The SECRETARY then read the description of Prof. HOUGH's new chronograph, which we print in another column.

Prof. PHINN: That is exceedingly interesting, and a wonderful achievement of science. The next thing must be to make the telescope record its own observations.

DR. VAN DER WEYDE: There is a small error which every observer makes in the time of his observation, which is nearly constant to the individual, and which is called the "personal equation." Prof. HOUGH has invented an apparatus to determine that personal equation, by which the observer records the time when he sees a ball crossing the field of view, and the ball itself records the actual time. But it will not do for the observer to attempt to correct his personal equation. If he finds that he records the time too late, he must not attempt to record it earlier, or he will be all wrong. He must still make the record when it appears to him to be the exact time; and then apply the personal equation. Then the telescope has been made to record its own observations. Mr. RUTHERFORD has taken many photographs of the Pleiades, with his large telescope; and by means of an instrument constructed specially for this purpose, the relative positions of the several stars can be measured with the utmost accuracy. These photographs have been thus tested at the Observatory at Cambridge, and have been found to yield results equal in accuracy to those obtained by direct observation in the best telescopes. By these photographs the relative motions of the different stars in this group can be ascertained.

Mr. J. R. FISHER: It is not unreasonable to expect that the passage of a strong light may be made to record itself. That has been done in the firing of a cannon at noon by the rays of the sun. It is not impossible that it may be done at some time with all the precision possible in human observations.

V. DEEP SEA LIFE.—Dr. CARPENTER has returned safely from the third trip in deep sea dredgings. His results quite bear out the conclusions drawn from the two previous ones. Some new facts, however, of extreme interest have been discovered, the publication of which we may expect shortly. It is hardly possible to exaggerate the importance of these investigations in their bearings on the most important general problems of biology, physical geography, and geology. They teach us that the bottom of the deep ocean is the home of many creatures, who live there in the absence of light, under great pressure, in water often excessively cold—just above freezing point—abounding in carbonic acid and in organic matter. Of these influences the one which makes itself most felt is that of cold. It is this, and not the pressure, not the bright sunlight, that stunts the creatures, and makes them reproduce at the bottom of equatorial seas the fauna of arctic surface regions. Nor is the life at these depths confined to low-born Foraminifera, or to that wonderful protoplasmic Bathyhima which Professor HUXLEY told the British Association, at Exeter, he had now found in soundings from many quarters of the globe, and which therefore seems to be a *vast thin sheet of living matter, enveloping the whole earth beneath the seas.* Where, as in certain regions, the deep waters are warm, highly organized beings of bright colors and well-appointed eyes are brought up by the dredge. These researches press upon us the question: "Is it possible for living matter to be born and nourished in the absence of light, in the presence of carbonic acid, and in the absence of any heat higher than the temperature of about 32 deg. F., in the absence, that is, of almost any force which can be transmuted into vital force?" At these great depths there is no vegetation, properly so called, and Professor WYVILLE THOMSON, who is associated with Dr. CARPENTER in these researches, is of opinion that here the lowest living beings feed on the lifeless organic matter which exists in so large a quantity in the water. We seem here to be near the transition from complex lifeless protoid matter and living protoplasm. The exact condition and nature of this organic matter is of extreme importance, and we understand a distinguished chemist is about to make it the subject of an inquiry. There is another point of no less interest. These organisms, which are thus building up chalk strata (for this deep Atlantic ooze is nothing but incipient chalk) at the bottom of the ocean are, to a very large extent, identical with many of the remains found in the chalk formations. This is so much the case that we may speak of races of animals building the old hills of millions of years ago, and laying now the foundation of the chalk-hills of times to come, themselves remaining unchanged all the time between.

DR. VAN DER WEYDE: The pressure at these great depths is no inconvenience to the animals, for it is equalized. It is interior as well as exterior. With regard to the absence of light, the fishes we find in the Mammoth Cave are as lively as other fish, and appear to be happy and contented. I found in those fishes rudimentary eyes, with the skin grown over them. They are probably descended from fish which have made their way into the cave through subterranean passages, and which have not had their eyes developed from the want of the stimulus of light. Those fishes grow fat, but are very pale, and the skin is very transparent. They look very different from other fishes. It is not wonderful that there should be life in the depths of the sea. It appears to be a law of nature that wherever life is possible, there is life. The deep sea life to-day seems to be identical with that of the cretaceous period; and cretaceous deposits are now forming in the bottom of the ocean.

Prof. PHINN: Some years ago I made some experiments to ascertain the effect of the primeval atmosphere, which was supposed to contain a large amount of carbonic acid, upon animal life. I found that the lower forms of life could bear with impunity a large amount of carbonic acid. A lizard would live for a considerable time in an atmosphere containing enough carbonic acid to kill a mouse almost instantly. Of course there is oxygen present even at the bottom of the ocean; and much of it escapes as it is brought to the surface. The lower the form of life, the greater is its power of resisting the action of carbonic acid, whether it is in the atmosphere or in the water.

VI. UNSOWN CROPS.—The sudden and apparently spontaneous appearance of unsown crops on a slight change in the condition of the soil, or of plants entirely new to the neighborhood, when fresh ground is tilled for the first time, is a well-known phenomenon. In particular, farmers are familiar with the fact of the universal appearance of sufficient white or Dutch clover completely to cover the ground when heath-land is first ploughed. It is very common also for railway embankments or cuttings to be covered, for the first few years after their construction, with plants indigenous to the country but new to the neighborhood. The usually accepted explanation of these facts is that the soil is everywhere full of buried stores of seeds of all descriptions, which require only favorable circumstances of warmth, light and moisture to bring them to life. In his Anniversary Address to the Linnean Society, the distinguished President, Mr. BENTHAM, points out the objections to this theory, which rests rather on circumstantial than on direct evidence. Where the seeds are not very small, as in the case with the white clover, they ought to be easily detected by a careful search, if present in sufficient quantities to form a complete crop. Mr. BENTHAM doubts also whether there is any satisfactory evidence of seeds retaining their vitality for any considerable length of time unless kept perfectly dry, as in the case of the grains of wheat preserved in Egyptian mummies; and calls attention to the rapidity with which large numbers of seeds may be transported to a given spot of earth in an exceedingly short space of time by the agency of birds. The interest and importance of this subject would amply reward a careful series of experiments and observations.

Prof. PHINN: Dr. LINDLEY, the botanist, obtained a quantity of matter from the stomach of a man that had been buried in England a great many years ago in an old Danish or Saxon tumulus; and he found in it several seeds which he identified as the seeds of wild fruit which formerly grew in England; showing that the man had eaten the fruit and the seeds, although not kept dry, had preserved their vitality; for these seeds were afterwards sown and plants grown from them.

THE PRESIDENT: How do you account for the fact that when a forest of pine trees is cut down oak trees take their place?

Prof. PHINN: I do not account for it. A great deal that is said about the age at which seeds will die is untrue. I had at one time a quantity of old seeds that had been put away for fifteen or twenty years, and many of these that all authorities pronounced worthless grew. Climate has a great deal to do with it. In Egypt or in this country seeds may last longer than in England. The equal temperature found in the soil tends to preserve the vitality of seeds.

Dr. BRADLEY: I see nothing mysterious in the appearance of a crop of oaks in the place from which a pine forest has been cleared off. Everything is changing, appearing and reappearing. We have a succession of crops; why not of forests? May there not have been, previous to the pine crop, beech, maple or oak crops? It seems to me reasonable to suppose that.

Dr. VAN DER WEYDE: We don't get a wheat crop after rye without sowing it.

Dr. RICHARDS: Some classes of seeds will preserve their vitality longer than others. Oleaginous and aromatic seeds retain their vitality; and so do the lower grades of vegetables. Mosses will grow after having been dried two or three hundred years. With regard to the seeds never having been found, it is no evidence that they were not in the soil. The germ is very small, and the other portions of the seed may have been destroyed and the germ may be preserved. In the Mohawk flats a furrow cannot be turned up without producing an enormous crop of mustard. It would be interesting to search for the mustard seeds, which, being aromatic and oily, would resist the ordinary influences of moisture and temperature for a long time. The facts referred to have given rise to vague ideas about the creation or formation of new plants without seed. While it is easy for me to conceive that the hand that created the first plant could create another, we have no proof of such creation; and it would be very interesting to make a search for the existence of seeds in the soil.

Prof. PHINN: I question whether the oak would grow from the germ alone, without the pabulum furnished by nature to sustain it. It was the suggestion of HENRY THOREAU that it was the squirrels which brought the acorns from a distance and buried them in the pine forests, in such quantities that you could not cut down a forest of pine trees beneath which a crop of oaks had not been sown by the squirrels within a few years.

Dr. RICHARDS: It has been found that seeds which would not germinate when exposed to the ordinary influences of the atmosphere, would grow on being moistened with preparation containing chlorine. Some change of circumstances may revivify a germ which under ordinary exposure would be destroyed.

THE PRESIDENT: Probably the reason why the pine does not

grow so well where it has just been cut down, is that the soil is exhausted of the peculiar qualities required for pine; and from that very fact it is better adapted to other trees, which therefore take the place of the pine.

Dr. VAN DER WEYDE: It is the "struggle for existence." Seeds are present everywhere, and where there is a chance for them they will develope. When the soil is exhausted of the nourishment suited for the pine, of course other seeds not requiring that particular nourishment will develope more rapidly, and give the pine no chance to grow.

VII. THE DRAGON OF LYME REGIS.—The British Museum has lately received the fossil remains of a flying dragon, measuring upwards of four feet from tip to tip of the expanded wings. The bones of the head, wings, legs, tail, and a great part of the trunk, with the ribs, blade-bones, and collar-bones, are imbedded in dark lias shale from Lyme Regis, on the Dorsetshire coast. The head is large in proportion to the trunk, and the tail is as long as the rest of the body. It is extended in a straight, stiff line, the vertebral bones being surrounded and bound together by bundles of fine, long, needle-shaped bones. It is supposed to have served to keep outstretched, or to sustain, a large expanse of the flying membrane or parachute which extended from the tips of the wings to the feet, and spread along the space between the hind-limbs and the tail, after the fashion of certain bats.

The first indication of this monster was described by Buckland in the "Transactions of the Geological Society," and is referred to in his "Bridgewater Treatise," under the name of *Pterodactylus macronyx*. The subsequently-acquired head and tail give characters of the teeth and other parts which establish a distinct generic form in the extinct family of Flying Reptiles. The animal, as now restored, will be described and figured in the volume of the Monographs of the Palæontographical Society, for the present year, by Professor OWEN.

The President announced that at the next two meetings Prof. PHINN would read a paper upon electricity as a motive power.

Adjourned to Thursday next, at half-past seven o'clock P. M.

## Mining in North Carolina.

By H. E. COLTON.

THE mining district of North Carolina is comprised in the area west of a diagonal line running directly south-west from Weldon to the foot of the Blue Ridge. Nearly all the metals are found at one point or another in this region, and there are but few square miles where gold is not to be obtained, from soil or rock, in greater or less quantities. In this region are all the opened mines of the State. West of the Blue Ridge all the metals and many valuable minerals are known to exist in paying quantities, but no systematic operations of the mines have yet been carried on for want of railroad transportation. The well-known Ducktown Copper Mines border the western extreme of this country beyond the Blue Ridge. This section yields gray and yellow sulphurets and black oxide of copper, sulphuret, carbonate, and silicate of zinc, argentiferous galena, gold, and corundum of the most beautiful character, white, flesh-colored, mottled, and black marble, of a quality said by judges not to be surpassed in the world; vast veins of the richest chrome iron ore, and mountains of iron ore of every style and quality. Railroads at four points pierce this mountain country, and all this neglected wealth will soon be put to use.

I know of few sections offering so many inducements to miners or agriculturists. The climate has no superior. Land is cheap, by far the greater part of it covered with its primitive growth. On the western border lie the great coal-fields of Tennessee, while numerous rivers furnish immense water-power.

Mining operations in this State in former times were of two kinds, neither deserving the term system—one by the natives, the other by parties from abroad. Both worked in a great measure for speculative purposes, the latter almost invariably with that end in view. The former chiefly worked surface dirt or branch gravel and sand, sometimes going into quartz mining and employing the more simple machinery. The latter seldom condescended to touch dirt and the old-fashioned machinery, but struck deep into the rock, and erected large mills, with every form of patented machinery, whether tried or untried. I know that in one instance a New York company expended $25,000 in machinery that afterwards sold for $200 as old iron. It was put up, and with it the ore yielded no gold at all, while with the stamps and Chilian mill $75 to $150 per day was taken out. During this utter failure at the mine, a company was made up in New York, and the original holders made money by selling out their stock. This is a sample of dozens of instances.

Perhaps the only instance of surface work by Northern men was in Rutherford county, where Commodore STOCKTON carried on his large operations. He made money there, but lost it in a quartz mine below Charlotte. There are now persons making money working these deposits, and there are hundreds of acres yet untouched which will pay well to work. A practical miner, who has lately been over the State, told me a few days ago that Burke county was one of the best mining regions he knew of anywhere. In that county, Rutherford, and Polk, and still further west, in Transylvania and Jackson counties, all along the eastern base of the Blue Ridge, are many acres of soil holding free gold.

In copper mining the same state of things has existed. The mines have been worked for speculative purposes. Now they have fallen into the hands of a few men at a small proportion of their original cost, and some are and others will be worked as a matter of business.

The failures in mining in North Carolina, are due simply to a want of business-like management and to the former lavish expenditures. Another cause for profitable surface work and the loss in deep shaft mining, may be in the fact that nearly all the vein gold in North Carolina is found in sulphuret of iron.

At the present time mining operations are being carried on at various points in the State with success and profit. But the work is quietly done and you hear nothing of it. Near Charlotte, the Stephen Wilson Mine and several others are doing well. At Gold Hill, work has been recommenced, and quantities of gold are taken out. In Montgomery county, several surface mines are being worked with profit. At Silver Hill there are over one hundred and fifty men and miners at work. This remarkable mine, now, without doubt, the most valuable of its kind in this country, has been sunk, to prove the vein, six hundred and fifty feet at one point, and two hundred and fifty at another farther north. These two shafts are being connected by a level at the depth of the latter. It is a true vein in hard clay slate, and the vein-stone, talcose slate, frequently mixed with dolomite. The dip is more than forty-five degrees, frequently almost perpendicular, and the vein varies in width from two to sixteen feet. There are two veins at the surface and at about four hundred feet depth they come together; here the vein is over twenty-five feet in width, and a mass of silver valued at $20,000 was taken out. Up to that point both veins were worked, but since only one has been followed. The ore is argentiferous galena, containing zinc-blende. It is now carried to New York and made into a white paint called zinc lead. It is roasted at the mine to deprive it of its sulphur, and save weight. It seemed to me that some money might be made by utilizing this waste. At present they haul the ore to the N. C. R. R., twelve miles, and hence the saving of weight is a considerable item, but it is contemplated to build a railroad to or near the mine and then there can be no excuse for this waste.

This mine was originally worked for its lead, silver and gold, but the zinc blende was troublesome, and caused a loss of all these metals. Then the Cornish buddles were put up, and a system of concentration was adopted. But this amounted to little, as the ore is so fine-grained and compact that the best concentration gave only sixty per cent. of lead, while an average sample of the ore yields about thirty per cent. of galena; and while the ore seldom has less than $15 per ton of silver and gold, the concentrated material, which was supposed to result from the concentration of ten tons in one, seldom yielded over the value of $50. That this was the fault of the manner of buddling rather than of the system itself, many practical miners have affirmed, and this ore will yet yield up its gold and silver to proper effort and skill. At this time the whole property is under the charge of Messrs. C. T. REYNOLDS & Co., of New York, who work it solely for the paint. At the time of my visit to North Carolina they were shipping 400 tons per month of roasted ore, and are opening the mine so as to ship twice that quantity. Hence, now, at the minimum of $12.50 per ton, at least $5,000 per month is being thrown away. It is safe to presume that such shrewd business men as the members of this house are reputed to be will find some means of making available this $60,000 per year. I have thus expatiated as to this mine, as it is now the largest metal-mining interest on the Atlantic slope, and has been of immense benefit to the people of that section of North Carolina.

Near this mine are several copper mines which are being carefully worked; in Guilford, also, two or three in which operations have been recommenced. In the Deep River country (Chatham county) is the Clegg mine, at which are being carried on the largest copper-mining operations in the State. It is a well-defined vein of sulphuret, with some carbonates of copper, dip almost perpendicular. There are many other equally valuable properties in this section, which, with the final success of the Clegg, will be developed. The trouble with all these mines just now is to find a sale for their ore, on account of the failure of the Baltimore Copper Company.

In this same Deep River region is the coal field. The coal is bituminous, and has been opened along the outcrop for a distance of thirty miles. No southern outcrop has ever been found. At Egypt a shaft has been sunk 450 feet deep, striking six feet of coal and twenty inches of a peculiar iron ore, impregnated with bitumen and fossils. This ore is mined in getting out the coal, and as it yields richly of oil may some day be of value. This mine is now owned by A. J. DERBYSHIRE, of Philadelphia, and under his direction the water is being drawn from the shaft preparatory to working. It is so arranged that about 30,000 tons of coal per year can be raised. The coal is the same in quality as the English Newcastle, and will probably reach a market at Norfolk over the Chatham Railroad. No large system of coal mining can ever exist in this region but several more mines of equal capacity can be opened when proper facilities of transportation are afforded.

South of the coal fields, on the Cape Fear river, is the largest deposit of iron ore east of the Mississippi river—an immense hill of specular (oxide of) iron containing millions and millions of tons. It was worked slightly during the war, but only to such an extent as merely to prove the value of the ore. There are other deposits of great extent and similar nature in the same region as well as on Deep River. The ore mentioned, as in connection with the coal, was supposed to be the same as the Scotch Black Band, but it has too much phosphorous in it to be profitable for iron making. Brown hematite exists at several points.

Throughout this whole section are water-powers of great volume and permanency—particularly at Lockville. The great need of the country is enterprise and capital devoid of speculation. The whole State is rich in mineral wealth that needs only business management to yield large profits.

## Composition of a New Cement.

MR. WARNER claims to be the inventor of a new cement, in which the silicate of iron enters into combination with the sulphate of lime and soluble phosphates, acids and other chemical equivalents; these different substances giving to the cement more durability for outside work. He takes the scoriæ or slags of furnaces, powders them and mixes them intimately in a common flour mill with sulphate of lime; previously to this sulphate of lime has been added a certain proportion of a soluble sulphate. The proportions vary with the application of the cement. The following proportions are usually taken:—Calcined sulphate of lime, 700 lbs.; silicate of iron (slags, scoriæ, etc.), 300 lbs.; soluble phosphate of lime 2¼ lbs. Water is then added when the cement is to be used.—*Journal of Applied Chemistry.*

## The Causes of Regional Elevations and Subsidences.

Read before the American Philosophical Society, April 7, 1871, by Lieut. C. E. DUTTON.

Lieut. C. E. DUTTON desired to submit certain views, which he had been led to entertain, respecting the causes of regional elevations and subsidences. He was unacquainted with any views on this subject in the writings of geologists, which seemed to be satisfactory. In reflecting upon the nature of metamorphic rocks, and the probable changes which they had undergone, he thought that the facts brought to light by the researches of BISCHOFF, DAUBREE, SORBY, STERRY HUNT and others in that field, might contain, also, a solution of the unexplained problem of elevations and subsidences. It is now a generally accepted opinion among writers upon chemical geology, that metamorphic rocks have reached their present condition through the combined agencies of heat, pressure, and water, acting upon sedimentary strata; that sulphur, carbonic acid and volatile chlorides and fluorides have played highly important parts under similar conditions, and that soluble earths and metallic salts and vapors have had no considerable influence upon the totality of changes. That water especially, under the influence of a moderately high temperature and great pressure, is capable of changing in a wonderful manner the structure and arrangement of rocky materials of all kinds, has been abundantly shown by innumerable synthetical experiments, a great number of which have been summed up by DAUBREE in an able memoir on the subject to the French Academy. He has also shown that minerals, which, under ordinary temperatures to which water is subjected, are in no respect changed, may be completely altered by water confined in strong vessels and heated to dull redness. Silicates, aluminates and calcareous matters in the amorphous condition, may not be only made crystalline, but their degrees of hydration may also be permanently altered; and he also mentions the production of anthracite by a similar process, from wood. Indeed, the changes both of structure and chemical constitution, which may be produced in this manner, are very great, and extend, in all probability, to nearly the whole range of mineral matters found in the rocks.

Now if, as is generally believed and accepted, these are the changes in progress, while rocks are undergoing metamorphism, then, in all probability, the rocks are undergoing at the same time *a change in their specific gravity.* It is highly probable, if water is the chief reagent, and if it constitutes a change both chemical and physical, that the specific gravity of the mass, into which it enters, is not the same as it was before such a change took place. But if we admit this, then we have also admitted that the volume of those rocks has either increased or diminished. If we assume it to have increased, there must take place an expansion, and such an expansion must necessarily be upward. For, beginning at the lowest level at which any such change may be assumed to supervene, the total weight of the superincumbent mass is the same as it was before, and hence there would be no change at that level. Nor could there be lateral expansion of any importance; all expansion would of necessity be vertically upwards. On the other hand, a decrease of volume would occasion a subsidence for converse reasons.

If we were to assume a change in the specific gravity of 1,000 feet of rock to the extent of five per cent. we could account for a change of level of 50 feet, and a series of rocks as thick as the carboniferous in this State, would, with an equal amount of change, give an alteration of level equal to the average altitude of the North American Continent above the ocean. It is, of course, impossible to conjecture the depth to which metamorphic action may extend, though it is undoubtedly very great; at least eight or ten miles, and there might be no great improbability in supposing such changes to take place through a large portion of that depth at the same time.

That the rocks far down below the surface take up under the influence of great pressure, aided no doubt by heat, large quantities of water, carbonic acid, sulphydric acid, and perhaps other electro negative agents, is manifest in the materials issuing from volcanoes and from thermal springs. Water and gaseous acids issue in such enormous quantities from volcanoes, as to constitute a large fraction of the entire mass delivered, indicating that the solid materials have become supersaturated with them, and the association is resolved as soon as they reach the surface of the earth, and are relieved of the pressure to which they have been subjected.

The overflow of volcanoes would, it is suggested, be susceptible of a similar explanation. Let us suppose a stratum or two, situated a few miles below the surface, become softened or lightened by the combined agencies described, so as to be specifically lighter than the average mass of overlaying rock. If a vent or fissure could be found, such a plastic mass would inevitably follow the laws of the equilibrium of fluids, and would not only rise up into the chasm, but overflow. Putting the problem into another form, the heavier overlying mass would sink into the lighter semi-fluid beneath, and drive it upwards. It is a well-known fact that the lavas are all of small specific gravity. Indeed, were it otherwise, Lieut. DUTTON thought that the overflow of a lofty volcano like Ætna or Mauna Loa, would be impossible; for a column of dense material of such a height, exerting its pressure upon its subterranean reservoir, would raise the overlying strata, instead of rising above them. But, in truth, the superior strata are doubtless heavier, and exert a greater pressure upon the reservoir than the lava itself.

In a similar manner Lieut. DUTTON sought to explain the in-

trusion of traps, trachytes and basalts. These rocks were probably lighter than those which originally overlaid them, and forced their way through weak places to the surface. The traps, basalts and porphyries—at least such porphyries as may be called intrusive—though they are unquestionably altered sediments, are for the most part amorphous, and not crystalline. They were evidently altered at a comparatively low temperature, and at no very great depth. They do not appear to affect the strata into which they are intruded, and withal, are less highly metamorphic than gneiss or marble. Water seems to have been the chief agent in their transformation, and they may have been forced upward in a soft condition, and upon being relieved of the pressure, parted with the greater portion of this water. The traps and basalts also exhibit many planes of cleavage, with very perceptible interstices, and these interstices would seem to be much wider than could be accounted for by the contraction of cooling. He stated that he had often noted this fact, and was decidedly of the opinion that the contraction of these rocks by loss of heat, could by no means account for the entire width of such planes of cleavage, and believed that it was in great part due to the loss of water, which had once rendered them plastic.

If these views be correct, then we ought to expect that volcanic regions will be confined to those areas which have recently been regions of marked elevation. And we find this to be the case. In America, the whole extent of the Rocky Mountains and of the Andes, so far as known, was covered by the ocean at the beginning of the Tertiary period. The elevation of the Rocky Mountains was probably earlier than that of the Andes, and sooner completed. Hence, while the former was the scene of an unparalleled amount of volcanic action during the Pliocene and Miocene, and is now nearly, or quite, quiescent, except in Southern Mexico, the Andes still abound in active volcanoes. The East Indian volcanic regions are all of Tertiary formation, as are those of the Mediterranean and the Auvergne.—*U. S. R. R. and Mining Register.*

## A Printing Chronograph.

By Prof. G. H. HOUGH, of the Dudley Observatory.

ABOUT the year 1848 the idea of recording astronmical observations, by the use of galvanic electricity, was put in successful operation by different individuals. Since that time chronographs of various forms have been constructed for recording in a legible manner on a moving sheet of paper the time of any phenomenon observed. The great superiority, in point of accuracy and saving of labor over the old eye and ear method, formerly used, led to the almost general adoption of the new plan. During the past ten years the idea of constructing a chronograph, which should print with type the time of the observation, has been entertained by a number of persons. About five years since Prof. HILGARD, of the Coast Survey, read a description of an apparatus designed for this purpose, and about the same time Prof. C. A. YOUNG, of Dartmouth College, published a proposed plan for one, in *Silliman's Journal of Science.* But, so far as we are informed, the mechanical construction of such an apparatus has not heretofore been attempted by any one. The construction of a machine which shall carry a type wheel capable of giving impressions, with uniform velocity for a number of hours together, without sensible variation in its motion, is a problem which is not easy of solution.

Some five or six years ago, in a paper read before the Albany Institute, I gave an account of the method I proposed to adopt, and in the construction of the machine, now to be described, the plan then proposed has been generally followed. My plan, which is radically different from any other proposed, is based on the principle of using separate systems of mechanism for the fast moving type wheel, and those recording the integer minutes and seconds, regulating each with electro-magnets controled by the standard clock. For a clear understanding of the mechanism, elaborate drawings would be necessary. We shall, therefore, merely give a general account of its construction and peculiarities :

I. A system of clock-work carrying a type-wheel with fifty numbers on its rim, revolving once every second ; one, two, or parts of two numbers being always printed, so that hundredths of seconds may be indicated. This train is primarily regulated to move uniformly by the Frauenhofer friction balls, and secondarily by an electro-magnet acting on the fast moving type wheel, and controlled by the standard clock. This train is entirely independent, and can be stopped at pleasure, without interfering with the other type wheels.

II. A system of clock-work consisting of two or more shafts, carrying the type wheels indicating the minutes and seconds. The motion of this train is also governed by an electro-magnet, controled by the standard clock, operating an escapement, in a manner analogous to the action of an ordinary clock ; every motion of the escapement advancing the type one number. There are three type wheels, indicating minutes, seconds and hundredths of seconds. The integer seconds are advanced at every oscillation of the standard pendulum ; and the minute, at the end of each complete revolution of the seconds wheel. The type-wheels are constructed of brass disks, around the circumference of which is soldered a strip of electrotype copper, holding sixty numbers.

Presuming now we have this system of type-wheels in operation, it is necessary to print without disturbing their motion ; especially is this true for the fast moving wheel. After a long series of experiments, during which the fast moving wheel was detached and stopped in various ways, we finally made the impression from the spring of the hammer only ; not allowing the blow to fall directly on the type, but arresting it about half an inch before it reached the top of the type. By this device, which is regarded of the greatest importance, the motion of the type is not disturbed an appreciable amount. Any number of impressions following each other in rapid succession does not disturb the fast moving wheel the one-hundredth part of a second. By this plan, none of the type wheels are stopped, or locked in the act of printing, and records of observations may follow each other as fast as the hammer can be made to deliver the blow.

If the record is made while the type-wheel indicating integer seconds is in the act of escaping, two numbers, or one number and part of another, is printed, so there is never any ambiguity about the record ; this condition, of course, only occurs when the fast-moving wheel indicates 0.95 to 0.00 sec. If two numbers are printed when, for example, the hundredths read 98, the smaller of the integer seconds is the correct one. The time required for the action of the escapement is about 0.06.

The blow for printing may be struck directly, by means of a strong electro-magnet ; but the cost and trouble of keeping up a large battery for this purpose led us to do all the work mechanically, only using electricity as the governing power. Accordingly, a heavy running gear was built for raising the hammer, capable in its present form of delivering 800 blows without winding ; and it can be readily modified to give ten times that number, if desirable. This gearing is entirely detached from the hammer when elevated, but is unlocked just before the hammer reaches the type, immediately raising it again. The time consumed for this operation is about three-tenths of a second, allowing, therefore, observations to follow each other at a minimum interval of one-half second. When the hammer is elevated it is locked by an electro-magnet, the operating of this magnet allowing it to fall and print. The armature time of the hammer is about 0.07 seconds, being but little in excess of our ordinary chronographic recording pen.

The types are inked by means of small rollers, covered with cloth, resting against their rim, and revolving with the wheel by friction. These rollers require inking every two or three days. If desirable, the inking rollers may be dispensed with, and impression paper used instead. After numerous experiments made with both methods, we have preferred the ink.

The paper fillet two inches in width, is wound on a small spool, holding about 40 feet, and drawn between two rollers, the same as a Morse Register. Every time the hammer falls, the fillet is advanced about one-quarter of an inch, by the action of an escapement driven by a weight. One spool of paper will hold about 1200 observations, including the spacing for different objects. This same escapement is also operated by an electro-magnet, under the control of the observer, who by pressing a key is able to make spaces of any width between the prints.

The train carrying the minutes and integer seconds, will run eight hours ; the gear for elevating the hammer will deliver 800 blows ; and the train for moving the paper fillet will go 1200 times without winding. The fast moving train runs one hour and thirty-six minutes ; but since this train can be stopped at pleasure, without changing the zero of the type, its comparatively brief running is not a serious inconvenience.

To recapitulate, we claim the following principal points : 1st. Separate movements for the integer seconds, and the hundredths of seconds ; 2d. The method of regulating the hundredths of seconds wheel, by an electro-magnet in connection with the standard clock ; 3d. The method of printing double or single numbers without stopping the type-wheels ; 4th. The method of striking the blow, indirectly using the spring of the hammer ; 5th. The method of elevating and locking the hammer. The minor details for paying off the paper fillet, inking the type, etc., may be accomplished in various ways.

The battery power required is about the same as for an ordinary chronograph. Three GROVE elements or six HILL'S elements, work the two electro-magnets well. A separate battery of about the same size is used for the hammer and fillet magnets.

In point of accuracy, this machine leaves nothing to be desired, and is much beyond what we thought possible. From a vast number of experiments, made by recording automatically the beats of the standard clock, both at the middle and end of the oscillation, the mean error for a single print is found to be about 0 013 sec., equal in this respect to the recording chronograph. The maximum difference in the records of the beats seldom exceeds 0.03 seconds ; and we believe this is as much due to the irregularity in the clock connection as in the running of the machine, since the same thing is found in ordinary chronograph records, where the measures are made from second to second.

During the building of the machine, which was accomplished by my assistant, Mr. FOREMAN, and myself, the past winter, as we could find the time, a great many experiments were tried in the method of regulation, printing, etc. The fast-moving train was used to propel the integer seconds, and minute type wheels, dispensing with the auxiliary movement, but the disturbance of its motion was considerable, especially at the end of every minute, when it had double duty to perform. We think, however, by taking the power from the shaft turning once in a minute, and giving uniform motion to the type, it might be successful ; but nothing would be saved in the amount of machinery, and the liability of losing integer seconds from accidental disturbance would be a serious inperfection in the method. As now constructed, there is hardly a possibility of error in the integer seconds without a serious disarrangement of the mechanism. If the fast-running train is stopped entirely, it only requires about six seconds to bring it again in coincidence with the clock pendulum.

The saving of time and labor by the use of a printing chronograph is very considerable. At the lowest estimate, it does work equivalent to the labor of one person where three are employed at the same time. In our zone work in former years, when the zone extended two hours in right ascension, it usually required the labor of two persons a whole day to convert the chronographic records into numbers and copy them on the blank forms. With the observations printed, the labor is only that of copying, and can easily be done by two persons in two hours.

In regular transit work, where five or fifteen wires are observed, there will be no necessity for copying the separate wires, as the mean can readily be deduced from the printed fillet, or it may be cut and pasted in the record book. The machine is readily adjusted to indicate the same numbers as the clock's face, the type being so set as to point zero-hundredth when the pendulum is at its lowest point where the magnetic circuit is completed. In the construction of the apparatus provision was made for attaching engraved rings to the type-wheel shaft, showing at a glance the time. But these are found not essential, as they would but little facilitate the setting of the type, which is accomplished as follows : The minute type-wheel, which is free to move in either direction, is revolved to correspond to the correct minute. An impression may then be taken and the machine started, when the clock indicates the same, the seconds being readily counted from the beats of the magnet regulating the fast-moving train. The whole time for this adjustment need never exceed two minutes.

In the observation of zone stars, the type may be set to give the integer seconds of mean right ascension, so that the final reduction will always be a small quantity.

## The Detroit Tunnel.

THE building of the great sub-fluvial tunnel under the Detroit river, the completion of which is now assured by the practical consolidation of the Michigan Central and Great Western Railroads, will be the greatest engineering work of its kind ever projected in this country, if not in the world. The lake tunnel at Chicago, though of considerable length, is of small capacity, and will bear no comparison with that to be built at Detroit, while those carried under the river at the former city, though of good size, are so short as to be in all respects inferior to the present undertaking as engineering works. In the magnitude of the plan of its construction, in the capacity it will have under water, and in the amount of business which will pass through it, the Detroit tunnel will certainly have no rival upon this continent until the long contemplated scheme of uniting New York with the New Jersey shore by a tunnel under the Hudson is carried into effect.

The plan finally adopted by the tunnel company for the construction of the great work is substantially the same as that prepared some months since by Mr. CHESBROUGH, of Chicago. The length from the Detroit to the Canada portal will be 8,568 feet. It will be built in two separate parts, with a view to diminishing the amount of excavation necessary, and lessening the liability to accident, and also for the important consideration that, if an accident should occur in one-half, the other would still be available for the passage of trains. The parallel tunnels will be cylindrical in form, and will be fifty feet apart. The interior diameter of each is eighteen and a half feet, and at all points under the river the shell of masonry will be two feet in thickness. The excavation will be made through a stratum of hard clay, and it is not intended that it should at any point come within less than twenty feet of the surface of the bed. Whenever it is found that the distance is less than this average, clay will be filled in to a sufficient depth to avoid the possibility of accident. In addition to the main tunnels a small drainage tunnel, with an interior diameter of five feet, will be built considerably below the main lines and midway between them. This will be first constructed, in order to drain the main tunnels while the work progresses, as well as afterwards, and also to fully develop the character of the soil at the commencement of the work. The grade of the transit tunnels is one in fifty at each end, with 1000 feet of level line under the river. The estimates for excavation and masonry are as follows :

| | Cubic yards. |
|---|---|
| Excavation in open cutting | 200,000 |
| " " tunnels | 233,000 |
| Brick masonry (exclusive of drainage tunnel) | 68,000 |
| Stone masonary | 3,700 |

A working shaft, ten feet in interior diameter, will be sunk on each bank of the river midway between the main tunnels, and connected with them by lateral drifts, each with an interior diameter of nine feet. It is estimated that, without sinking any working shafts in the river, the work can be completed within two years. The entire cost of the tunnel and approaches, including a permanent double track of steel rails, right of way at the ends, etc., will amount to $2,650,000. The work of constructing this important international tunnel will be undertaken by a company chartered by the Canadian Parliament under the name of the Detroit River Transit Company, and such action as is needed to secure incorporation under the laws of Michigan has already been taken. This company is organized on a basis of $3,000,000 capital, and is authorized to issue stock and bonds, and to consolidate with any company organized for the same purpose under the laws of Michigan. The money for the undertaking will mostly be obtained abroad, either stock or bonds being placed in the English market and funds obtained at a comparatively low rate of interest, not over six per cent. The two railways interested in its completion, the Michigan Central and Great Western of Canada, will probably guarantee the payment of interest on such stocks or securities as may be issued, and the advantage gained for the lines in doing away with the costly ferriage system now established, and in the increased certainty and speed of shipment across the river, will certainly more than repay the cost of the tunnel in a few years. The enterprise is one of great magnitude and importance, and its completion will mark the beginning of a new era in American railroad engineering.—*The Iron Age.*

## MINING SUMMARY.

### Colorado.

THE MINES OF CARIBOU.

A correspondent of the Central City *Register* thus writes from Caribou, April 16, of the mines in that locality: The improvements that have been made here within the last three months in the way of building, and the developement of our mines, give a promise of permanency that cannot fail of realization. The main shaft of the Caribou mine at a depth of 170 feet carries a three-foot vein of the well-known "first-class Caribou ore." Drifts will be started from the bottom, giving a "lift" of 60 feet for back-stoping. The upper stopes carry a vein of rich ore throughout their whole length that will average 12 inches in width. The East shaft worked by the old CARIBOU Co., now 90 feet deep, has a very fine vein of ore 14 inches in width. A portion of the mine appears better and is in a finer condition for working than we have ever before seen it. Westward, and supposed by some to be an extension of the Caribou, is the 7-30 lode, owned by Messrs. HIDE & Co. The shaft is 22 feet deep, has been excellently timbered, and in the bottom shows two veins of ore; one on the South wall four inches wide, and a smaller vein on the North. Both veins assay very high. Adjacent to this on the South, is the Black Warrior lode, owned by FREEMAN & Co. The shaft is 30 feet deep, and the whole vein is said to average $50 per ton. The Poor Man lode is being worked by MCKENZIE & Co. The shaft now 60 feet deep, shows a solid vein of ore from four to six inches in width. At the Sherman lode, situated between the Poor Man and Caribou, owned by HAVENS & ANDERSON, we saw some very fine ore. They have lately been timbering, but expect to resume active mining soon. The Ivanhoe lode on the same hill owned by GOOD & KELLEY, has a shaft 19 feet deep, and for the amount of developement is very promising. The Idaho boys have resumed work on their mine, and are timbering, preparatory to an active summer's campaign. The Coral lode, near the new town of Cardinal, and close to the Trojan, has a shaft 60 feet in depth, and is five feet between walls. In this mine, at its present development, gold is the predominating metal, though the evidences are that it is changing to silver. Work on the Trojan has stopped for the present, on account of water. Messrs. HINE & Co. are talking of putting up a stamp-mill on their property, the coming summer. Near Sherwoodville, the only mine being worked, is the Eldorado. ROBIDOUX & Co. are the fortunate owners. An average assay of samples taken from the dump, gave at the rate of $348 66 per ton. They are laboring under the same difficulties as the TROJAN Co., as to surface water. The general characteristics of the ores of this locality resemble those at Caribou. The Boulder and Caribou wagon road is approaching completion, and it is thought will be ready for travel by May 1st.

### Nevada.

NEW ORE DISCOVERY.

The Gold Hill *News*, April 28, says: A large silver and gold-bearing quartz lead, which assays very richly, has recently been discovered near Walker river, some forty miles above the lake. It is named the Grutli, and averages about forty feet in width. There is plenty of wood, water and grass near by, and the lead can be worked to excellent advantage. It is apparently a very valuable discovery and is only about sixty-five miles from Gold Hill.

CONCENTRATION OF ORES.

Mr. THOS. WREN, of White Pine, has brought to perfection a concentration machine upon which he has been engaged for a long time. The object of the machine is to concentrate the metal-bearing and reject the valueless rock. The estimated cost of the reduction is only $2 per ton, whereas the saving would be equal to several times that amount in the item of crushing alone. So says the *Reveille*.

BY DIVINING ROD.

According to the White Pine *News*, seven thousand dollars, in good gold coin, have been expended in sinking a shaft near Treasure Hill, by authority of the divining rod. The shaft is now down 180 feet, through solid limestone. There is no indication yet of even the color; but the work is still to go on—an example of faith not often witnessed.

FROM SILVER PEAK.

We take the following from the Reese-River *Reveille* of April 24: At Silver Peak some splendid developments have lately been made. A lode, called the Lodi, and belonging to Mr. STANSBURY, and on which three men have been at work for about two months, is turning out beyond the most sanguine expectations. Two cuts, one sixty and the other forty feet, disclosed a continuous vein averaging four feet in thickness, which will mill not less than $150 per ton in gold and silver. With the present small amount of opening, Mr. STANSBURY feels confident that, with a force of six miners, he could supply the Manhattan mill with as much ore of that grade as it could work. The great drawback of the place is the want of mills, the nearest one running is the Montezuma mill, some eighteen miles distant. This would not prove an insurmountable difficulty, however, as the ore could easily stand the expense of eighteen miles of hauling; but the mill has more of its own ore than it can work: and whatever custom work they do they give the preference to mines of their own district. The only other mill within reach is the 40-stamp mill of the Great Salt Basin Company, which has been working the gold ores of Red Mountain. They, too, have more ore than the mill can work. At present the mill is stopped, and cannot start until new machinery is procured. The boilers are burned out so badly that no engineer can be found who will take charge of them; and not only this, but other portions of the mill machinery are worn out. The company have turned their attention to the development of their silver veins and are meeting with flattering prospects. They are patenting their various mines, and when they start again will turn out gold and silver bullion in large quantities.

### Montana.

PROSPECTING ON THE YELLOWSTONE.

The *Pick and Plow* insists that a rich mining region had been discovered on the waters of the Yellowstone, on what is known as Clark's Fork. As near as we can find out says the Idaho *Statesman*, impartial testimony shows that as yet it is only known for certain that there is a fair chance for the opening up of a good mining region there. The prospects thus far obtained are only sufficient inducements for further prospecting. JEFF STANDIFER and a party of about 200 are in the Yellowstone valley awaiting the disappearance of the snow from off the range to go in there. This party are going to prospect, and go thus strong in numbers on account of the Indians. We would advise our people to await further advices before moving in that direction. We know something about that country, and we honestly think there are far better fields for prospecting in the Salmon River mountains than there.

ARGENTA ITEMS.

The *Independent* contains the following: A gentleman just in from Argenta, says that STAPLETON is running his furnace with profit. The company that own the Rattlesnake ditch are working on the bars and small gulches near Argenta, and are doing well. A new company has commenced operations in the silver mines of Argenta. The old Eisler mill has been purchased by the company, and new machinery and buildings are being put up. From present indicatione, Argenta will be more prosperous than ever before.

GOLD CREEK ITEMS.

A writer in the Montana *Gazette* says: The mining season has already commenced. Ditches are cleaned out and everything in readiness, and with fair weather there is no obstacle in the way to prevent us from going right in. Speculators are arriving in this camp and already have bought some mining ground on Pilgrim Bar at high figures. Our Celestial friends are, as usual, buying ground and rushing around after more. They have bought some on Pilgrim Bar for $1,500, paying one-third down and the rest in instalments. There are several arrivals from the States. The town of Yamhill, on the bar, is increasing fast. Several new buildings going up in the town of Pike's Peak have been moved on to higher ground out of reach of the tailings from Pilgrim Bar. Water has been turned into Rock creek ditch, Willow creek ditch, Pike's Peak and Pioneer ditch, the old Carother's ditch, Dock Young's ditch and the Keystone ditch, the combined capacity of which will furnish the Gold creek mines with 1,700 inches of water, and Pilgrim bar with some 3,200 inches with the first melting of the snow. In the lake at the head of Rock creek ditch, there is now some sixteen feet of water, which will furnish miners a full supply. We are also informed, says the *Independent*, that the Cable ditch company consisting of CON KOHRS, HAYS and BATTATON, have been pushing forward their ditch through the winter months, and about the 15th of May water will be turned upon the rich placers of that camp.

### California.

NEVADA COUNTY.

The *Grass Valley Union* of May 7 contains the following information in regard to mines in that vicinity:—The mines of Grass Valley district are in the usual prosperous condition. The old and developed quartz mines are working constantly, and in almost every instance, with profit to the owners. The gravel mines which are opened are doing well, while the prospecting ventures for gravel are encouraging. The Eureka mine made a good month's run for the last month, and has started for the present month with extraordinary prospects of doing well. We understand that a few days since some of the richest rock ever yet taken from the Eureka came to the surface. This specimen rock was more gold and sulphurets than quartz. The Eureka mine is so regular in its habits of paying, and its habits are so well known, while at the same time its management is so regular and systematic that a description of its operations are not necessary. The Eureka is working along at the same old steady pace. The Idaho mine on the same ledge as the Eureka, and adjoining the Eureka on the East is also steadily paying. We have no precise figures from the Idaho, but we have the reliable information that the yield is large. East Eureka mine is the mine heretofore known as the O'Connor mine, or as the Grass Valley Consolidated mine. An English company now own this mine, and are putting upon it a crushing mill, besides a hoisting and pumping machinery. The mill is being built under the charge of MR. RIGBY, one of the best constructors of quartz mills who has yet visited this part of the State. The East Eureka is a new enterprise on a somewhat developed ledge, and we believe that the property will be good. Webster mine is located on the celebrated Randolph Hill, and as it has lately attracted much attention, on account of its rich returns, we give a few of the particulars concerning it. The Webster Company have for some years been hunting for a rich lead in Randolph Hill, and have sunk two shafts. The first shaft bottomed on a crevice of the bed rock, and this crevice contained gravel which was rich in gold. All who saw the gold and the gravel of the crevice supposed that the Webster Company had struck the regular channel of gold-bearing gravel. In a short time the crevice was exhausted and a less plucky company would have given up in despair of finding anything else. The Webster men, however, had started to find the lead and they did not look backward. They took the top of the bed rock and drifted into the hill. Very soon it was shown that high bed rock fell again and began to show where the lead might be found. The developments from these explorations running from the first shaft, showed that another shaft further up the hill, but which would bottom lower on the bed rock, was an economical way to work the lead. A new shaft was accordingly put down, and steam hoisting and pumping works were erected at the new shaft. The new shaft bottomed on gravel, and rich gravel at that. In drifting from the bottom of the second shaft it was ascertained that the bed rock pitched into the hill, but at the same time a large body of the gravel varying from six to ten feet in thickness was upon this bed rock. A drift was run nearly South from the second shaft along the rim of the pitching bed rock and a breast was commenced. This breast is now being worked with splendid results. The breast of gravel is about 85 feet long and has been carried along for about 20 feet. The bed rock is rolling, but has a general inclination. The gravel of the breast has paid well. During this week, or for six days, 195 ounces, in round numbers, of gold have been taken from the drift, and this was worth $3,510. The men employed as drifters have been 20 in number, divided into two shifts of 10 men each. This will give a labor account of $360 for the week. Water expenses and the cost of running the machinery amount to comparatively a small sum. It will be seen that the profits of the Webster mine are very large. We visited the mine yesterday, and looked at the dirt as it came up in the cars. We could see gold in every car-load raised. Underground appearances are most favorable, and judging by work done heretofore on the claims the channel is a wide one. We believe that the Webster mine is in a channel which runs across the hill, as Mr. JENKINS, working on the South side of the hill, has about the same kind of gravel and the same quality of gold that the Webster Company are taking out. We believe that the Webster Company have a reasonable fortune in their mine. Altona mine on Alta Hill is being worked in that careful energetic and miner-like manner which characterizes the Superintendent, Mr. JEFFERY. The Altona shaft is sunk into bed rock, passing through rich gravel which overlies the bed rock, and from the bottom of the shaft, and in the bed rock a tunnel is being run. In about two weeks this tunnel will be completed when the Altona will have opened a large extent of ground and will be prepared to take out gravel with advantage. Steam machinery for hoisting is on Altona's claims. No pumping is necessary, as the water is easily controlled by tanks, which are hoisted now and then, as occasion requires. The break into gravel at the Altona is anxiously awaited. Hope Gravel mine is doing well. Last week the Hope cleaned up 107 ounces of gold, worth about $1,800, and this week another good run was made and about 100 ounces were cleaned up. The Hope crushes all that comes out of the mine, and saving is cleaner than it is in the Webster mine. Gravel in the Hope looks well, regular runs are anticipated, and it may be that the bed rock tunnel now about completed and which runs easterly, will tap a large body of rich gravel. A former working showed that the rich body of gravel exists at the point to which the bed rock tunnel is being run. Alta No. 3 Company are at work, and the owners seem much encouraged at their prospects. The shaft bottomed on high bed rock, higher by fifty feet than was expected but in every way from the bottom of the shaft, where drifts have been run the bed rock pitches. On this bed rock more or less gold is seen in gravel. The company seem determined to find out what is under their location. Hope Company No. 2 are getting machinery into place for the purpose of sinking to bed rock. The Hope No. 2 is East of Hope claims and is near the East slope of Alta Hill. A company of men are working the John Bright mine on shares, and the working has proved very successful. The John Bright mill has five stamps. A few days ago a run of quartz was cleaned up and the result was the sum of $2,100. This sum gives the miners who are at work, on shares, at the John Bright, the handsome wages of $6 per day to the man. The same kind of co-operative mining, in this district, will be carried on this year in a number of instances.

PLACER COUNTY.

The Colfax correspondent of the Auburn *Herald* furnishes the following mining notes: I saw yesterday some excellent prospects from a ledge lately discovered at Secret Town by PETER GROVES & Co. They are now forty feet deep, and the ledge will average two feet in thickness. The gold is generally diffused through the rock, as you cannot crush the least particle but you can find a good prospect. PETER is one of those good-natured, persevering, hard-fisted miners that is not discouraged at trifles, but delves away as if the next lick would give him a fortune. I think his reward is at hand. The prospects of the Rising Sun were never better than at present. I have no means of knowing the amount taken out weekly, but would safely say, judging from the quantity of rock on the dump, that they will pound out little less than $7,000 this month, which is big for a five-stamp mill. J. A. HOAGLAND & Co. will move their machinery from Iowa Hill in a few days, to Emigrant Gap, and expect to have it in operation on the 1st of July. This is a new ledge which I have alluded to before. One of the owners informed me a few days ago that they continued taking out rock, and as they proceed the ledge becomes better defined and continues to show more gold, with every evidence of being a permanent and paying claim.

THE GREEN MINE.—WM. G. GREEN of this mine got his new four-stamp mill and one Hepburn pan to work last week, and run through twelve tons of ore which yielded some $14,000 in melted gold—over $1,100 to the ton. This is the most remarkable and astounding yield we have ever chronicled, and we doubt if it has ever had its equal from the same amount of gold-bearing quartz. The machinery is new and was only run at intervals during the week as it was being perfected. Another new pan will arrive this week and be placed in position, and when everything is completed it is expected that some ten or twelve tons of ore per day will be worked and all the gold saved. There is now on the dump at the shaft of this mine about one or two hundred tons of ore, fully half of which is rich and the remainder common grade. This mine has been very extensively prospected by shafts and drifts, and all and more than all the expenses, including the mill, pans, machinery, etc., have been met and paid by running small portions of the quartz through an arastra occasionally or pounding out gold in a hand mortar. These are literal and actual facts, and to sensible men need no comment from us. If a quartz mine yielding from $15 to $30 per ton is considered a vast fortune, what are we to say of this ledge, only one and a half miles from here, which mills over $1,000 to the ton?

### Arizona.

The *Prescott Arizona Miner* has the following mining news: C. Y. SHELTON and others from Walker district were in town early in the week. SHELTON had just cleaned up his arastras after crushing about 10 tons of unassorted rock from the Vernon. We did not learn the precise result; but were informed that a couple of buck-skin purses seen in his possession were well filled with the dust, indicating the usual good return from that rich lode. Mr. POINTER had made a run on the Pointer ore, of several tons, and realized $75 per ton, and is consequently very jolly. No man in this country better deserves good fortune, and we rejoice with him. The recent rains have raised the mountain streams, and the placer miners are very busy. About two sluice-heads of water are running in Lynx creek, and the boys at work there are getting from $4 to $15 per day each. From the Hassayampa we hear a similar story. Men are scattered along the creek from NOYES & CURTIS' quartz mill, for eight miles down the stream, and all are doing well. The latest sensation in the Big Bug is a new lode recently discovered a mile or more below the mill, reported to be very rich in gold. The same paper says in regard to mining in the Bradshaw district: The owners of the original Grey Eagle have commenced opening their claims, and found a strata of decomposed quartz therein, from which L. ELLIT took three panfuls and washed out $1 75 in free gold, and estimated that the gold visible in the small quartz left in the pan was worth $4 to $5. Yet the Grey Eagle is called a silver lode. The Lorenna shows now a five-foot crevice, with ore as rich as that on the surface. Specimens shown us from the Eclipse and Cougar shafts are in keeping with all the reports previously had from those rich lodes. From MORELAND'S claim on the Tiger to BEAN & Co.'s claim on the South extension of the same, 5,600 feet distant the claim owners find the ore richer and the vein wider as their work progresses. From the Moreland shaft we have seen pieces of argentiferous galena of great richness, out of a vein of that ore four feet thick, and below the water-level. From BEAN & Co.'s tunnel, during the past ten days, we learn considerable quantities of horn silver have been taken. Messrs. GRIFFIN and others had returned to Bradshaw from a prospecting trip to Silver Mountain, —8 to 10 miles distant,—and brought in very rich specimens of silver ore from newly discovered lodes. No Indians have troubled the prospectors or their stock. Following are some of the sales made since our last report: W. L. SHERWOOD to FRED. KRUGER, 200 feet in Marr claim, South Tiger, $500. H. HAGAN to H. M. HERBERT, 200 O. K. lode $500. H. C. GLOVER to C. Y. SHELTON, interest in Twin lode, $20. J. C. TAYLOR to JNO. M. ROUNTREE, 50 feet in Grey Eagle, $500. H. M. CURRY to C. A. LUKE, 200 feet in Bradshaw lode, $450. E. S. JUNIOR to J. W. KNOT, 200 feet in South Tiger, $500. KNOT & GLEASON to F. GREGORY. 133½ feet in South Tiger, expressed consideration, $100. D. HENDERSON to Major C. H. VEIL, 25 feet in Grey Eagle, and 25 feet in Clipper, $250.

## MARKET REVIEW.

### The Coal Trade.

NEW YORK, May 19, 1871.

ANTHRACITE.—The prospects for immediate resumption of operations in the various mining districts are extremely favorable.

The miners of the entire Schuylkill region went to work on Monday last and are now trying hard to make up for lost time. Agreably to promise, the President of the Reading Railroad Co. reduced his freight to $1 85 from Port Carbon to Philadelphia, making no distinction for shipments East and South. The freights on the Schuylkill Canal were reduced at the same time to $2 15, thus placing Schuylkill county for the present on a fair basis for business in our markets. How long this rate of freight will remain in force we are not promised; the order reads "for the present." We think that the company expects to make up for what they have lost during the "long strike," and that as soon as business is fairly under way an advance will be proclaimed.

The men in the employ of the Lehigh Coal and Navigation Company also began work on Monday last upon the terms adopted by the Lehigh operators in Philadelphia on the 22d of February last (which we published at the time). We learn, however, to-day that in consequence of the refusal of the company to employ hands that are on a strike, belonging to other mines in the vicinity, the men have resolved to quit work again. This difficulty arises from a compact made among the Lehigh operators that when any of their neighbors' men were on a strike these men should be debarred from the privilege of working in other or adjacent mines. It will be recollected that in our last issue we stated that there seemed to be no evidence of any attempt being made among the Lehigh men to get to work. The fact of this *one* operator resuming operations, was not then known to us. In taking the position noted above, either the miner or the operator evidently intends to try and starve the other out; and in either case we may expect a long and damaging strike. This question of interference by the men as to the practical government of the mine or of the operator of one mine, refusing employment to a miner because the same was a "striking" member of an adjacent mine has always caused much difficulty in the coal mining district and may be said to be the foundation of all our strikes of the past few years. It seems to us that the umpire, Judge Elwell, should be called upon to decide these questions positively, and both operator and miner should feel in duty bound to respect and abide by his decision.

The Wilkesbarre Coal and Iron Company, in the Wilkesbarre region, are running shifts, night and day, and are turning out immense quantities of coal. At their point of shipment (Hoboken, N. J.) we learn that they have entirely overcome the difficulty that has existed for two weeks back, viz.: the detention of vessels, and that now one or two days is the longest delay for some sizes of coal, and other sizes are delivered immediately. This certainly is one of the best-managed companies in the coal business, and the public are to be congratulated particularly in this, from the fact that the coal is also of good quality and meets a ready sale.

We learn that the West Pittston shaft of the Pennsylvania Coal Company began operations to-day, and that the remainder of their men will go to work Monday. They resume on a compromise of 93½c. per diamond car. It will, therefore, be scarcely a week before this formidable ally of "low prices" will be in the market. "A word to the wise is sufficient."

Private telegrams announce this morning a meeting of the miners in the Scranton district, to be held to-day, with every prospect of a favorable result, and that work in that section will be resumed on Monday next. It is believed that the riots and murders that have been committed at Scranton during the past week are entirely local with the Lackawanna Coal and Iron Company, and that they will not interfere as regards a general resumption. It is much to be regretted that any blood has been spilled in the settlement of our late troubles, but from time immemorial it seems to have been the custom to kill somebody at the conclusion of a long strike, and one should almost suppose that it has grown to be a necessity. We however think the Miners' and Laborers' Association should be held to some accountability for such transactions, and some chastisement should be inflicted upon the perpetrators of these villainous acts, provided they are members of the association. We have heretofore held a good opinion of the organization, and we had hoped that nothing would occur to cause us to change that opinion. With the settlement of the difficulty in the Scranton District we shall have the Delaware and Hudson Canal Company and the Delaware, Lackawanna and Western Company again pouring their immense product into the market. Along with the latter we behold visions of auction sales and many other beauties peculiar to the trade. Now, then, as we are in a fair way for "plenty to do," how shall we begin? Low prices! Let us have low figures at the outset, gentlemen; it is the only guarantee of a successful and safe business for the balance of the year. Our immense production must be gathered in as fast as it arrives, and *low figures* is the only way to make consumers in the family and manufactory and retail coal dealers throughout the country lay in a stock. There must be no chance of a loss, then all will buy confidently and largely.

PRICES.—There is not enough Coal coming to market to entirely ease it up yet, sales are made at from $8 to $8 50 to those who can't wait. Orders are taken for two weeks ahead at from $7 to 7 50; one month ahead, $6 50 to $7 00.

FREIGHTS.—Vessels are yet in good supply and freights remain low.

CUMBERLAND.—The demand is fully up to the supply and we have to note a steady market with prices firm. We quote $6 50 in schooners to arrive; $7 00 in barges alongside.

FREIGHTS are a trifle firmer. We quote Boston, $2 50; Bridgeport, $2 25; New York, $2 00; Providence, $2 25, from Georgetown and Baltimore.

### Anthracite Coal Trade for 1870 and 1871.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending May 13, 1871, compared with week ending May 14, 1870.

| COMPANIES. | 1870. WEEK. | 1870. TOTAL. | 1871. WEEK. | 1871. TOTAL. |
|---|---|---|---|---|
| *Phila & Reading R.R. | 36,564 | 906 294 | 14,747 | 699,647 |
| Schuylkill Canal " " | 2,854 | 61,120 | 5,802 | 87,308 |
| Lehigh Valley R. R. | 64,431 | 1,180,470 | 14,324 | 471,541 |
| Lehigh & Sus. R. R. | 22,138 | 332,471 | 33,937 | 186,207 |
| Lehigh Canal | 12,109 | 44,595 | 1,979 | 7,317 |
| Scranton North | 13,459 | 227,668 | .... | .... |
| " South | 34,179 | 637,539 | .... | .... |
| Penn. Coal Co., rail | 24,468 | 382,695 | .... | 3,566 |
| " " " canal | 720 | 2,975 | .... | .... |
| Del. & Hud. Canal Co. | 56,913 | 277,424 | .... | 4,660 |
| " " East | 5,318 | 165,424 | .... | 52,560 |
| " " West | 365 | 25,565 | .... | 12,720 |
| South | 14,784 | 126,531 | .... | .... |
| Shamokin | 8.69 | 148,738 | 18,766 | 222,164 |
| Trevorton | 2,945 | 24,892 | .... | .... |
| Lykens Valley Coal Co. | 1,775 | 3,047 | 2,302 | 25,582 |
| Wyoming South | .... | 17,363 | .... | .... |
| Wyoming North | .... | .... | .... | .... |
| P. N. Y. U. & R. R. Co. | 4,942 | 109,879 | .... | 35,467 |
| Williamstown Col'y | 7,440 | 96,895 | .... | .... |
| Big Lick Col | 2,064 | 9,089 | 3,783 | 40,053 |
| Total | 320,920 | 4,744,533 | 95,220 | 1,848,792 |
| 1870 | 95,220 | 1,848,795 | | |
| Decrease week and year | 225,700 | 2,895,737 | | |

*Less coal transported for Company's use and Bituminous coal.

### Bituminous Coal Trade, 1870 and 1871.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending May 13, 1871, compared with week ending May 14, 1870.

| COMPANIES. | 1870. Week. | 1870. Year. | 1871. Week. | 1871. Year. |
|---|---|---|---|---|
| B. & O. R. R. | 20,250 | 274,230 | 27 974 | 402,519 |
| C. & O. Canal | 19,739 | 105,722 | 20,305 | 169.130 |
| Cumberl'd Branch | 3,184 | 28,092 | 1,753 | 27,825 |
| " Canal | 3,865 | 22 832 | 5,852 | 51,230 |
| H. & B. T. R. R. | 8 073 | 104 526 | 10,133 | 130,323 |
| Harrisburg & D. | 15.256 | 212,971 | 24,697 | 283,160 |
| L. V. R. R. | .... | 5,156 | .... | 23,325 |
| P. & N.Y.C. & R. Co. | 6,146 | 78,019 | 6,916 | 106,544 |
| Total | 76,513 | 829,548 | 97,630 | 1194,056 |
| | | | 76,513 | 829 548 |
| Increase. | | | 21,127 | 364,508 |

### Philadelphia and Reading R. R.

Amount of coal transported on the Philadelphia and Reading Railroad during the week ending Saturday, May 13, 1871:

| | |
|---|---|
| From St. Clair | 6,469 14 |
| " Port Carbon | 2,734 19 |
| " Pottsville | 30 02 |
| " Schuylkill Haven | 1,240 13 |
| " Auburn | 3,039 13 |
| " Port Clinton | 1,207 07 |
| " Allentown and Alburtis | 4 19 |
| " Harrisburgh and Dauphin | 24,697 13 |
| Total paying freight | 39,415 00 |
| Coal for Company's use | 4,233 17 |
| Total for week | 43,658 17 |
| Previously this year | 924,896 11 |
| Total | 968,555 08 |
| To same time last year | 1,183,940 09 |

### Report of Coal Transported over Central R.R. of N. J. (Lehigh and Sus. Div.)

Week ending May 13, 1871-Compared with same time last year.

| WHERE SHIPPED FROM | WEEK 1871., tons ct | WEEK 1870. tons ct. | YEAR 1871 tons cwt. | YEAR 1870. tons cwt. |
|---|---|---|---|---|
| Wyoming Region | 35986 18 | 30980 07 | 186503 11 | 365642 16 |
| Upper Lehigh Region | | 3317 18 | 4614 06 | 26337 00 |
| Beaver Meadow Region | | 3038 04 | | 12279 09 |
| Hazleton Region | 455 05 | 5945 10 | 2151 01 | 24537 16 |
| Mahanoy Region | | | | |
| Trescow Region | | | 1043 08 | |
| Mauch Chunk Region | | | 21165 14 | 30089 18 |
| Totals | 36442 03 | 43281 19 | 215477 15 | 463886 19 |
| Increase | | | | |
| Decrease | 6839 16 | | 253409 04 | |
| DISTRIBUTION. | | | | |
| Forwarded East of Mch Chunk by Rail | 29537 01 | 23438 17 | 186207 06 | 332471 03 |
| Forwarded East of Mch Chunk by Canal | 1628 05 | 12362 05 | 6066 03 | 47776 08 |
| Delivered at and above Mauch Chunk | 596 08 | 1112 08 | 19788 16 | 14125 14 |
| Delivered to L. & B. R. R. at Plymouth Bridge | | 6447 12 | | 64623 11 |
| L. V. R. R. at Packer'n | 680 09 | 320 17 | 3415 10 | 9890 03 |
| Totals | 36442 03 | 43281 19 | 215477 15 | 463886 19 |
| Of the above there was transported on acc'nt of L. C. & N. Co. | | 93 16 | 22402 01 | 46713 15 |
| W.-B. C. & I. Co. | 33765 09 | 14396 04 | 16.065 17 | 146947 01 |
| Totals | 33765 09 | 14490 00 | 182467 18 | 193690 16 |
| Increase | 19275 09 | | | |
| Decrease | | | 11222 18 | |

### Lehigh Canal Coal Trade.

Shipped for the week ending May 12, 1871.

| | WEEK. Tons. Cwt. | TOTAL. Tons. Cwt. |
|---|---|---|
| Total from Mauch Chunk Region, | | 280 14 |
| " " Beaver Meadow " | | 7 8 12 |
| " " Mahanoy " | 186 07 | 457 19 |
| " " Hazleton " | 384 09 | 1120 10 |
| " " Upper Lehigh " | | |
| " " Wyoming " | 1408 16 | 4729 13 |
| Total | 1979 12 | 7317 08 |
| Corresponding week last year | 12109 14 | 44565 03 |
| Increase | | |
| Decrease | 10130 02 | 37277 15 |

### Report of Coal forwarded by Pa. & N. Y. R. R. Co., for week ending May 13, 1871.

| | BITUMINOUS. Tons. Cwt. | ANTHRACITE. Tons. Cwt. |
|---|---|---|
| By Rail | 6,916 07 | .... |
| Previously this year | 99,628 11 | 35,467 11 |
| Total by Rail | ..... | ..... |
| By Canal | ..... | ..... |
| Previously this year | ..... | ..... |
| Total by Canal | ..... | ..... |
| Total for the year | 106,544 18 | 35,467 11 |
| To the same time last year | 78,019 00 | 109,879 19 |
| Increase | 28,525 18 | d 74,412 08 |

### Report of Coal Transported over Lehigh Valley Railroad

Report of coal tonnage for the week ending May 13, 1871, and previously this season, compared with same time last year:

| WHERE SHIPPED FROM. | WEEK. Tons. Cwt. | TOTAL. Tons. Cwt |
|---|---|---|
| Total Wyoming | 1,202 12 | 77,207 12 |
| " Hazleton | 2,112 10 | 221,615 05 |
| " Upper Lehigh | | 442 06 |
| " Beaver Meadow | 128 11 | 75,377 06 |
| " Mahanoy | 11,520 14 | 166.444 15 |
| " Mauch Chunk | 5 15 | 2,252 11 |
| Total Anthracite | 15,030 02 | 543,339 15 |
| Bituminous Coal from all sources | | 23,325 00 |
| Total by rail and canal | 15,030 02 | 566,664 15 |
| Same time last year | 79,.16 02 | 1,363,275 12 |
| Increase | | |
| Decrease | 64,385 00 | 796,610 17 |
| Forwarded East from Mauch Chunk by rail | 13,324 02 | 471,541 18 |
| Same time last year | 64,431 06 | 1,180,470 14 |
| Increase | | |
| Decrease | 51,107 04 | 708,928 16 |

RECAPITULATION.

| | | |
|---|---|---|
| Forwarded East from Mauch Chunk by rail | 13,324 02 | 471,541 18 |
| To N. C. R. R., at Mount Carmel | | 18 00 |
| Forwarded North from L. & B. Junction | | 38,641 05 |
| To L. & S. R. R. at Packerton for rail | 188 16 | 2,645 10 |
| Delivered at M'h Chunk | 16 02 | 415 64 |
| Delivered on line of road above Mauch Chunk | 56 08 | 3,817 00 |
| Delivered above Mauch Chunk for use of L. V. R.R. | 873 18 | 18,272 02 |
| To L. & S. R. R., at Penn Hav., for railroad | | 94 10 |
| Do. for canal | | 7,097 01 |
| At M. Chunk for canal | 570 16 | 3,797 05 |
| Total Anthracite | 15,030 02 | 543,339 15 |
| Bituminous Coal | | 23,325 00 |
| Total all kinds | 15,030 02 | 566,664 15 |

### Statement of Coal Transported over Cumberland and Pennsylvania Railroad

During the week ending Saturday May 13, and during the year 1871, compared with the corresponding period of 1870.

WEEK.

| | To C. & O. Canal. Tons. Cwt. | To B. & O. R. R. Co Tons. Cwt. | Total. Tons. Cwt. |
|---|---|---|---|
| 1871 | 20,506 12 | 27,974 16 | 48,260 08 |
| 1870 | 19,739 04 | 20,250 09 | 39,989 13 |
| Increase. | 566 08 | 7,724 07 | 8,290 15 |
| Decrease | | | |

YEAR.

| | | | |
|---|---|---|---|
| 1871 | 169,130 02 | 402 519 17 | 571,649 19 |
| 1870 | 105,722 05 | 274,230 04 | 379,952 09 |
| Increase. | 63,407 17 | 128,289 13 | 191,697 10 |
| Decrease | | | |

### Cumberland Branch.

WEEK.

| | | | |
|---|---|---|---|
| 1871 | 5,852 17 | 1,753 01 | 7,605 18 |
| 1870 | 3,865 12 | 3,184 09 | 7,050 01 |
| Increase. | 1,987 05 | | 555 17 |
| Decrease | | 1431 08 | |

YEAR.

| | | | |
|---|---|---|---|
| 1871 | 51,230 19 | 27,825 06 | 79,056 05 |
| 1870 | 22,832 04 | 28,092 17 | 50,925 01 |
| Increase. | 28,398 15 | | 28,131 04 |
| Decrease | | 267 11 | |

### Philadelphia & Reading Railroad and Branches.

COAL TONNAGE

For the Week ending Saturday, May 13, 1871.

BY RAILROAD—ANTHRACITE.

PASSING OVER MAIN LINE AND LEB. VAL. BRANCH.

| | Tons. Cwt |
|---|---|
| From St. Clair | 6,469 14 |
| " Port Carbon | 2,734 19 |
| " Pottsville | 30 02 |
| " Schuylkill Haven | 1,240 13 |
| " Pine Grove | 1,535 17 |
| " Tamaqua | 1,207 07 |
| " Harrisburg | |
| " Dauphin | 9,333 03 |
| Total | 22,551 15 |

FOR SHIPMENT BY CANAL.

| | |
|---|---|
| Passing Frackville Scales | 5,923 11 |
| " Mill Creek " | |
| " Schuylkill Valley Scales | 701 12 |
| " Mt. Carbon " | 103 14 |
| " Cressona " | 4,461 15 |
| " Pine Grove " | |
| " Tamaqua " | 410 14 |
| Total | 11,601 06 |

SHIPPED WESTWARD VIA NORTHERN CENTRAL RAILROAD.

| | |
|---|---|
| Passing Locust Gap | 4,714 05 |
| " Shamokin | 8,855 17 |
| " Herndon | |
| Total | 13,570 02 |

SHIPPED WEST OR SOUTH FROM PINE GROVE.

| | |
|---|---|
| Via Schuylkill & Susquehanna R. R. | 723 17 |
| " Lebanon & Pine Grove Branch | 701 14 |
| Total | 1,425 11 |

CONSUMED ON LATERALS.

| | |
|---|---|
| From Frackville Scales | 340 13 |
| " Mill Creek " | 137 06 |
| " Schuylkill Valley Scales | 815 17 |
| " Mt. Carbon " | 516 09 |
| " Cressona " | 127 06 |
| " Pine Grove " | 74 07 |
| " Tamaqua " | 50 08 |
| Total | 2,071 16 |

LEHIGH AND WYOMING COAL.

| | |
|---|---|
| Received via Allentown, E. Penn'a Br. | |
| " " Alburtis, " | 4 19 |
| " " Oreland, G. & N. Br. | 73 01 |
| " " Connecting R. R. " | |
| " " Willow Street R. R. | |
| Total | 78 00 |

BITUMINOUS.

| | |
|---|---|
| From Harrisburg | 15,364 10 |
| " Connecting R. R., G. & N. Br. | |
| " Junction R. R. | |
| Total | 15,364 10 |

COAL FOR COMPANY'S USE.

| | |
|---|---|
| Anthracite | 3,945 01 |
| Bituminous | 288 16 |
| Total | 4,233 17 |

RECAPITULATION.

| | Total for Week. | Corresponding week last Year. | |
|---|---|---|---|
| Passing over Main Line and Leb. Val. Branch | 22,551 15 | 36,234 02 | d13,682 07 |
| For Shipment by Canal | 11,601 06 | 2,316 12 | i 9,284 14 |
| Shipped Westward via Northern Central R. R. | 13,570 02 | 2,718 15 | i 10,851 07 |
| Shipped West or South from Pine Grove | 1,425 11 | 176 06 | i 1,249 05 |
| Consumed on Laterals | 2,071 16 | 1,715 11 | i 356 05 |
| Lehigh and Wyoming Coal | | 3,954 11 | d 3,876 11 |
| Total Anthracite paying fr'gt | 51,298 10 | 47,115 17 | i 4,182 13 |
| Bituminous | 15,364 10 | 9,492 16 | i 5,871 14 |
| Total of all kinds paying fr'gt | 66,663 00 | 56,608 13 | i 10,054 07 |
| Coal for Company's use | 4,233 17 | 2,877 14 | i 1,356 03 |
| Total Tonnage for Week | 70,896 17 | 59,486 07 | i11,410 10 |
| Since Dec. 1, 1870 | 1211916 16 | 1311540 16 | d 99624 00 |
| Total to date | 1282813 13 | 1371027 03 | d88,213 10 |

SHIPPED BY CANAL.

| | Total for Week. | Corresponding week last Year. | |
|---|---|---|---|
| From Schuylkill Haven | 5,252 00 | 3,024 17 | i 2,227 03 |
| " Port Clinton | 550 00 | 69 00 | i 481 00 |
| Total Tonnage per Week | 5,802 00 | 3,093 17 | i 2,708 03 |
| Since Dec. 1, 1870 | 81,503 17 | 87,569 08 | i 239?7 09 |
| Total to date | 87,308 17 | 60,663 05 | i26645 12 |

### Schuylkill Canal.

Report of coal transported over the Schuylkill Canal for the week ending Saturday, May 13, 1871.

| | Tons. Cwt. |
|---|---|
| From Port Carbon | |
| " Pottsville | |
| " Schuylkill Haven | 5,252 00 |
| " Port Clinton | 550 00 |
| Total for week | 5,802 00 |
| Previously this year | 81,506 17 |
| Total | 87,308 17 |
| To same time last year | 60,120 02 |

### Delaware and Hudson Canal Company.

The following is a statement of Coal transported by the Delaware and Hudson Canal Co., for the week ending May 13, 1871.

| | WEEK. | SEASON. |
|---|---|---|
| By Del. and Hud. Canal | | 4,660 00 |
| By Railroad East | | 52,560 00 |
| " West | | 12,720 00 |
| " South | | |
| TOTAL TONS, | | 69,940 00 |
| For the same period last year. | | |
| By Del. and Hud. Canal | 56,913 00 | 277,828 00 |
| By Railroad East | 5,318 00 | 165,424 00 |
| " West | 365 00 | 25,565 00 |
| " South | 14,784 00 | 126,531 00 |
| TOTAL TONS, | 77,380 00 | 599,348 00 |

### Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

| SCHUYLKILL. | AT NEW YORK, May 16. R. A. | W. A. | AT PHILADELPHIA. May 15. R. A. | W. A. |
|---|---|---|---|---|
| Lump | $ — | $ — | — — | — — |
| Steamer | 8 50 | — — | — — | — — |
| Broken | 7 70 | — — | — — | — — to — — |
| Egg | 8 25 to 8 75 | — to — — | — — | — — to — — |
| Stove | 8 75 to 9 00 | — — | — — | — — to — — |
| Chestnut | 7 50 to — | — — | — — | — — to — — |
| Pea | — — | — — | — — | — — |
| LEHIGH. | | | | |
| Lump, (along side) | — — | — — | — — | — — |
| Broken | — — | — — | — — | — — |
| Egg | 9 00 | 9 00 | — — | — — |
| Stove | 10 25 | 10 50 | — — | — — |
| Chestnut | 9 00 | — — | — — | — — |
| Pea | — — | — — | — — | — — |
| SPECIAL COALS.* | | | | |
| Diamond Vein | R. A. 7 50@8 00 | | — — | — — |
| New England | " | | — — | — — |
| Locust Mountain | W. A. | 8 50 | — — | — — |
| Honey Brook, Leh | W.A. | | — — | — — |
| Spring Mountain | " | " | — — | — — |
| Sugar Creek | " | " | — — | — — |
| Sugar Loaf | " | " | — — | — — |
| Old Comp'y's | " | " | — — | — — |
| Cross Creek | " | " | — — | — — |
| Room Run | " | " | — — | — — |
| Girardville | " | " | — — | — — |
| McMichael | " | " | — — | — — |
| Shamokin | " | " | 7 25 | — — |
| Lykens Valley | " | " | 7 75 | — — |
| Broad Top | " | " | 6 25 | — — |
| Hill & Harris | " | " | 7 75 | — — |
| Henry Clay | " | " | — — | — — |
| Powelton | " | " | 6 25 | — — |

[*Dealers in these coals may be found in our advertising columns.]

### Company Coals.

May, 1871.

No quotations during strike.

| | L. | Str. | Gra. | Eg. | Sto. | Ches. |
|---|---|---|---|---|---|---|
| Scranton at E. Port | — — | — — | — — | — — | — — | — — |
| Pittston at Weehawken | — — | — — | — — | — — | — — | — — |
| Lackawana at do | — — | — — | — — | — — | — — | — — |
| Wilk'b're at Hoboken | 8 00 | 8 25 | 8 25 | 8 25 | 9 00 | 8 25 |
| Old Co. Lehigh at Pt. Johnston | — — | — — | — — | — — | — — | — — |
| Lehigh at E. Port | — — | — — | — — | — — | — — | — — |

For freights to different points see "Freights."

### Prices for Coal at Mauch Chunk.

May 1871.

BITUMINOUS COALS.

| | |
|---|---|
| Kittaning Coal Co.'s Phœnix Vein...f.o.b. at Phila. | $ — |
| Lemon " " " | — — |
| Cumberland Vein Coal | — — |
| Consolidation Coal Co.'s on board N. Y. | 6 75 |
| Maryland Coal Co. | 6 75 |

### Prices at Baltimore—May, 1871.

*Wholesale Prices to Trade.*

| | |
|---|---|
| Wilkesbarre, by cargo or car load | $ — @ — |
| Pittston and Plymouth, do | — @ — |
| Shamokin Red or White Ash, do | — @ — |
| Lykens Valley Red Ash, do | — @ — |
| Zerba Valley | — @ — |
| Treverton | — @ — |
| By retail, all kinds per ton of 2240 lbs. | — @ — |
| Georges Creek & Cumberland f. o. b. at Locust Point for cargoes | 4 75@4 85 |
| Fairmount and Clarksburg gas, f. c. b. at L. Point | 6 00@6 50 |

### Freights.—May, 1871.

| TO EASTERN PORTS. | Cumberland. From Georgetown. | Cumberland. From Baltimore. | Anthracite. From Philadel'a. | Anthracite. From Port Johnston, and Hoboken. | Anthracite. From Newburg. | Anthracite. From Rondout. |
|---|---|---|---|---|---|---|
| Amesbury | .... | .... | $2 50 | $1 75 | .... | .... |
| Bangor | $2 75 | .... | 2 30 | 1 60 | .... | .... |
| Bath | 2 75 | 2 75 | 2 30 | 1 75 | .... | .... |
| Boston | 2 50 | 2 50 | 2 00 | 1 50 | .... | .... |
| Bridgeport | 2 25 | 2 25 | 1 75 | 1 00 | .... | .... |
| Bristol | .... | 2 60 | 2 00 | 1 25 | .... | .... |
| Cambridgeport | .... | .... | 2 75 | 1 75 | .... | .... |
| Derby | .... | .... | 2 00 | 1 25 | .... | .... |
| Dighton | 2 30 | 2 35 | 2 30 | — — | .... | .... |
| East Cambridge | .... | .... | 2 35 | 1 75 | .... | .... |
| Fall River | 2 25 | 2 25 | 2 50 | 1 25 | .... | .... |
| Hackensack | .... | .... | 1 75 | 1 00 | .... | .... |
| Hartford | 2 50 | .... | 2 50 | 1 25 | .... | .... |
| Jersey City | .... | 2 00 | 1 40 | 45 | .... | .... |
| Middletown | .... | .... | 2 25 | 1 25 | .... | .... |
| Mystic | .... | .... | — — | — — | .... | .... |
| New Bedford | 2 30 | 2 35 | 2 00 | 1 25 | .... | .... |
| Newburyport | 2 75 | .... | 2 65 | 1 60 | .... | .... |
| New Haven | 2 25 | 2 25 | 1 90 | 1 00 | .... | .... |
| New London | 2 25 | 2 25 | 1 76 | 1 05 | .... | .... |
| Newport | .... | .... | 2 00 | 1 25 | .... | .... |
| New York | 2 00 | 2 00 | 1 35 | 45 | .... | .... |
| Norwalk | .... | .... | 1 80 | 1 00 | .... | .... |
| Norwich | 2 50 | 2 25 | 2 00 | 1 10 | .... | .... |
| Pawtucket | 2 50 | 2 40 | 2 30 | 1 50 | .... | .... |
| Portland | 2 50 | 2 60 | 2 30 | 1 50 | .... | .... |
| Portsmouth, N.H | 2 75 | 2 75 | 1 45 | 1 60 | .... | .... |
| Providence | 2 25 | 2 25 | 2 00 | 1 25 | .... | .... |
| Rockport | .... | .... | 2 10 | 1 65 | .... | .... |
| Saco | 2 75 | .... | 2 25 | 1 75 | .... | .... |
| Sag Harbor | .... | .... | 1 70 | 1 20 | .... | .... |
| Salem | 2 60 | 2 75 | 2 35 | 1 50 | .... | .... |
| Stamford | .... | .... | 2 00 | 1 00 | .... | .... |
| Stonington | .... | .... | 2 00 | 1 25 | .... | .... |
| Taunton | .... | .... | 2 30 | 1 75 | .... | .... |
| Warren | .... | .... | — — | 1 40 | .... | .... |
| Washington | .... | .... | 1 25 | | .... | .... |
| TO RIVER PORTS. | | | | | | |
| Albany | .... | 80 | .... | 80 | .... | .... |
| Catskill | .... | 70 | .... | 75 | .... | .... |
| Cocksackie | .... | 70 | .... | 75 | .... | .... |
| Coeyman's | .... | 70 | .... | 75 | .... | .... |
| Cold Spring | 2 20 | 70 | .... | 75 | .... | .... |
| Fishkill | .... | 70 | .... | 70 | .... | .... |
| Haverstraw | .... | .... | .... | 70 | .... | .... |
| Hudson | 2 20 | 2 25 | .... | 75 | .... | .... |
| New York | .... | .... | .... | 45 | .... | .... |
| Nyack | .... | .... | .... | 70 | .... | .... |
| Poughkeepsie | .... | .... | .... | 70 | .... | .... |
| Rhinebeck | .... | .... | .... | .... | .... | .... |
| Rondout | .... | .... | .... | 75 | .... | .... |
| Saugerties | .... | .... | .... | 75 | .... | .... |
| Sing Sing | .... | .... | .... | .... | .... | .... |
| Stuyvesant | .... | .... | .... | 65 | .... | .... |
| Tarrytown | .... | .... | .... | 75 | .... | .... |
| Troy | .... | .... | .... | 90 | .... | .... |
| West Point | .... | .... | .... | 70 | .... | .... |
| Yonkers | .... | .... | .... | 40 | .... | .... |

### Prices at Georget'n, D.C., & Alexandria, Va.

May, 1871.

George's Creek and Cumberland f. o. b. for shipping..$4

### Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes ..$— —@— —
Lykens Valley .. .. .. .. .. .. .. .. .. — —@— —
Shamokin Red or White Ash.. .. .. .. .. .. .. — —@— —
Treverton and Zerbe Valley .. .. .. .. .. .. — —@— —

### Prices of Gas Coals.

May, 1871.

PROVINCIAL.

Corrected weekly by Louis J. Beiloni, Jr., 41-43 Pine st., N.Y.

| | Duty, $1 25, gold Coarse | Slack. |
|---|---|---|
| Block House | $1 75 @— 1 75 | |
| Gowrie | 1 75 @— 1 75 | |

Corrected by Bird, Perkins & Job, 86 South street.

| | Coarse. | Culm of Coal. |
|---|---|---|
| Pictou | $2 25 | @1 25 |
| Sydney | 2 25 | @— 80 |
| Lingan | 1 60 | @— 80 |
| Little Glace Bay | 1 60 | @1 00 |
| Caledonia | 1 60 | @— 80 |

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

| | Currency. |
|---|---|
| Westmoreland | 7 10 @7 25 |
| Fairmount Gas Coal Co. of N. Y. | 7 50 @— — |
| Despard Coal Co. | $7 50 @— — |
| Penn | 7 75 @8 00 |
| Newburg Orrel Gas | — @— — |
| West Fairmount Gs Caoal | 8 00 @— — |

AT PHILADELPHIA.

Powelton.. .. .. .. .. .. .. .. .

## The Action of Fluorspar on Different Qualities of Cast Iron.

Mr. JAMES HENDERSON has sent the following communication on the above subject to *Nature*, in which he states that attempts have been made to apply fluorspar alone to ordinary cast iron by eminent chemists in the laboratory, but the results have been of a negative character. These reports have been corroborated by his own experiments. He has discovered, however, that although fluorspar has no effect when used alone in treating ordinary cast iron, it will act energetically upon cast iron containing titanium. Titaniferous cast iron was made at Glaisdale Furnaces, near Whitby, by melting Cleveland white pig iron in a cupola in admixture with Norwegian titanic iron ore and blast furnace cinder as a flux. This metal was treated in the laboratory by being melted upon powdered fluorspar. The resulting metal was found to be wrought iron.

These results may be obtained in any suitable vessel, furnace, apparatus, or process; the only conditions necessary to be observed are, that the metal be maintained in the fluid state, and the fluorspar placed so as to act upon the metal from the under side upwards, or placed in admixture with it, and that when apparatus is used having silicious linings, the silicious linings be protected with sheet or cast iron placed upon the silicious lining before the fluorspar and iron to be treated are charged into the vessels. No labor is necessary except that of "balling" the metal, and removing it from the apparatus.

The results given by this experiment go to prove that by this process superior qualities of wrought iron, which will be purer than the highest standard brands of wrought iron, may be produced from the English Cleveland pig iron, which contains, according to the best metallurgical authorities, from 1·25 to 1·38 per cent. of phosphorus.

One ton of Cleveland pig iron was melted in a cupola with 7 cwts. of Norwegian titanic ore, containing, by analysis, about 40 per cent. of titanic acid. The resulting metal was titaniferous cast iron, analysing:

| | |
|---|---|
| Titanium | 1·2551 |
| Silicon | 1·8139 |
| Phosphorus | 0·4604 |
| Sulphur | 0·3620 |
| Carbon | 1·2982 |

Hence it appears that the iron, by being remelted with titaniferous iron ore, took up 1·25 per cent. of titanium, and lost 0·90 per cent. of phosphorus and 1·75 per cent. of carbon. It is obvious that the metal in this condition is not available for any purpose without subsequent treatment, as it contains about as great an amount of impurities as it did before treatment.

The advantage gained by remelting the pig iron with titaniferous iron ore, are a reduction of the amount of phosphorus and carbon, and the alloying of the metal with titanium, which facilitates the removal of the impurities in the subsequent treatment.

The above described titaniferous cast iron was remelted upon fluorspar, and about 30 minutes after the iron melted, or in about an hour after they were both charged, the iron was found to be malleable iron; the button analyzing as follows:

| | |
|---|---|
| Titanium | 0·0215 |
| Silicon | None. |
| Phosphorus | 0·1399 |
| Sulphur | 0·0620 |
| Carbon | Traces. |

When worked on a larger scale, so as to produce blooms that can be worked into merchantable shapes, the finished results will show less phosphorus and sulphur than the above analysis, as it is well known to metallurgists, by the experiments of Messrs. CALVERT and JOHNSON, published in full in KERL's "Metallurgy," vol. ii., "Copper and Iron," 1869, that 0·022 per cent. of phosphorus, and 00·40 per cent. of sulphur, are removed in working blooms into finished iron.

It will be seen that the action of the fluorspar removed 4·9622 per cent. of the impurities contained; and that the resulting metal contains less impurities in amount than the highest standard qualities of wrought iron. The explanation of these effects I leave to chemical investigators, without hazarding an opinion which might be erroneous, and, therefore, disadvantageous to me.

## The Relative Value of Different Kinds of Fuel.

THE evolution of force by heat, with motion as a resultant, is one of the most important of the laws of natural philosophy. Wherever motion occurs, heat must be recognized as the primary cause. The sun is the original source in the production of heat, as shown by its influence upon tides, winds, and the support of the life of plants and animals. Its effect is curiously displayed on the natives of the tropics, in supplying them with such sustenance by natural heat as to make very little food requisite; whilst, towards the frigid zone, the use of carbonaceous food becomes more and more necessary. The elements hydrogen and carbon, in combination with oxygen, evolve a greater amount of heat than any other elements. As hydrogen is not attainable, substances such as wood, peat and coal, which contain a large proportion of carbon, are chosen as the materials which by combustion produce heat. In the construction and building up of organic life, a certain amount of energy is invested by the sun's rays. In combustion, this energy re-appears as heat. This, in a few words, is the true theory of heat. The more a substance is capable of absorbing and rendering latent a certain number of units of heat, the more it is capable of giving out, when consumed with oxygen, appreciable and useful energy.

It is important to observe the comparative results available from what may be termed "current-going" heat, as developed by the work of a horse, and "conserved" heat, as shown in the work done by the combustion of fuel. This is demonstrated by the fact that the combustion of a single pound of coal in one minute is equal to the work of 300 horses for the same time. The extent to which any country is influenced by the possession of coal fields is evidenced by the following singular statement: Taking 10 pounds of coal per day, or 1¼ tons per year, as applied to the production of mechanical power through the agency of steam, to be equal to the labor of a man, every 10,000,000 tons of coal adds to the productive labor of England, a force equal to the exertion of 7,500,000 fresh men annually. A beautiful example of nature's constant law of "no waste" is afforded in considering the combustion of fuel. The exact amount of carbon which is set free by combustion, either of fuel or animal life, is again stored up in vegetation. The results of combustion, viz., carbonic acid and water, return to the earth to support the life of plants and trees, which absorb the carbon from the carbonic acid, setting free the oxygen again for the support of life or combustion, and obtain hydrogen from the water in the atmosphere. Each element retains its calorific power, and thus the fuel of the future is undergoing a constant process of formation from the results of the combustion of the fuel of the present.

A brief description may now be given of the different varieties of fuel used in the British Islands.

TABLE I.

| NAME. | WHERE FOUND. |
|---|---|
| 1. Wood | — |
| 2. Charcoal | — |
| 3. Peat | Ireland and moorland districts. |
| 4. Lignite | Germany and Devonshire. |
| 5. Bituminous coal | All English coal fields. |
| 6. Anthracite | Wales. |
| 7. Coke | — |

I. WOOD.—This is the original form of fuel. The objections to its use are, first, the comparative small amount of carbon it contains, varying from 40 to 53 per cent.; second, the amount of moisture it generally contains—the value of damp wood being one-third less than dry; third, the surplus of oxygen it contains, which retards conbustion. Wood is only used as fuel when it is abundant and coal is scarce.

II. CHARCOAL.—Charcoal is wood freed from its volatile ingredients. Owing to the scarcity of wood and inconvenience of manufacture, charcoal is only used as fuel when coal is scarce, or when a hot fire is desired in small compass. It is more pure than coal, but absorbs moisture to the detriment of its heating power. The following is a scale of the comparative heating value of different woods before and after being made into charcoal, No. 1 being the best.

TABLE II.

| | 1. | 2. | 3. | 4. | 5. | 6. | 7. |
|---|---|---|---|---|---|---|---|
| Wood | Fir. | Poplar. | Birch. | Sycamore. | Ash. | Elm. | Oak. |
| Charcoal | Oak. | Birch. | Poplar. | Fir. | Elm. | Sycam'e. | Ash. |

There is much more variety in the wood than in the charcoal, the former varying from 1,000 to 790, and the latter from 1,000 to 985.

III. PEAT.—Peat, resulting from the decomposition of vegetable matter in marshes, has about three-fourths the heating power of coal, and is used almost solely in the localities where it is found. It is difficult to obtain it free from earthy particles.

IV. LIGNITE.—This is an imperfect coal formed by wood buried in moist earth, and thus undergoing one of the changes leading towards the production of coal. It occurs rarely in the British Islands, but is used extensively in Prussia and Austria. It contains when found a large percentage of water, which is difficult to eliminate. It will be seen by Table IV. the extent to which the proportion of oxygen decreases in the change from wood to coal—lignite being the intermediate stage.

V. BITUMINOUS COAL.—This is the most important fuel, and presents the varieties of splint, caking, open-burning, and cannel coals. These are the coals used for steam, gas, household purposes, and for iron smelting, in the form of coke or otherwise. The splint and coking coals form the chief produce of the northern counties. Splint is a caking coal with a dull appearance. The open-burning coal also bears the name of "cherry" and "soft coal." The difference between the caking and the open-burning coal is probably due to the larger proportion of bitumen in the former, and of oxygen in the latter. Cannel coal is most valuable for gas purposes, a maximum proportion of hydrogen and a minimum proportion of oxygen being required for this. This coal has probably been originally formed from the densest vegetation. Its conchoidal fracture, lustreless appearance, and cleanliness to touch, are well known properties. The following is a table, exhibiting the relative quantities of heat given off by the same weight of each of the varieties of bituminous coal, from experiments made by Dr. T. RICHARDSON:

TABLE III.

| Species of Coal. | Locality. | Relative quantity of heat given out by the same weight of coal. Edinburgh=100·00 |
|---|---|---|
| Splint | Newcastle | 110·34 |
| " | Glasgow | 115·12 |
| Cannel | Lancashire | 117·83 |
| " | Edinburgh | 100·00 |
| Cherry | Newcastle | 116·68 |
| " | Glasgow | 112·12 |
| Caking | Newcastle | 122·12 |
| " | Durham | 114·98 |

VI. ANTHRACITE.—The coals belonging to this class are characterised by containing a much larger amount of carbon than any other variety, and but very little volatile substance. This coal is generally found in regions distinguished by igneous action, as in Wales and the Alps, and is, probably, bituminous coal, altered by transmitted volcanic heat into a natural coke. In Wales, the same bed may be traced from where it is bituminous to where it is anthracite. The smokeless nature of this coal makes it of great value as a steam coal, there being so little gas, the setting free of which usually carries off a portion of carbon as smoke, to escape.

VII. COKE.—When coal is freed artificially from the volatile gases, coke, which when produced from good coal is nearly pure carbon, is the result. The process of making coke is also resorted to for the purpose of removing the sulphur from the coal, and for producing a strong compact fuel for iron smelting. The component parts of several well-known combustibles are shown in the following table, in which may be observed the chemical decomposition of wood in its gradual conversion to coal:

TABLE IV.

| | Wood. | Peat. | Bovey lignite. | Boghead Cannel. | Wigan Cannel. | Newcastle Caking Coal. | South Wales Anthracite. | Durham Coke. |
|---|---|---|---|---|---|---|---|---|
| Carbon | 510 | 540 | 663 | 631 | 801 | 849 | 904 | 932 |
| Hydrogen | 53 | 52 | 56 | 89 | 55 | 45 | 33 | 7 |
| Oxygen | 417 | 282 | 229 | 70 | 81 | 67 | 30 | 9 |
| Nitrogen | — | 23 | 6 | 2 | 21 | 10 | 17 | 13 |
| Sulphur | — | 6 | 23 | 10 | 15 | 6 | — | — |
| Ash | 20 | 97 | 23 | 198 | 27 | 23 | 16 | 39 |
| Total | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Coke, per cent. | 213 | 293 | 308 | 302 | 604 | 750 | 921 | — |
| Specific gravity | ·81 | ·85 | 1·13 | 1·20 | 1·28 | 1·28 | 1·39 | — |

It will be seen from the above analyses that the proportion of hydrogen in fuel varies very slightly in passing from one condition to another, whilst the quantity of oxygen is very materially less as the process of coal formation progresses. This is the simple cause of the higher calorific power of coal as compared with wood and peat. The greater portion of the oxygen is set free by natural distillation, and hence carbon and hydrogen constitute a large proportion of the residue.

The following table shows an analysis of the different coal found in England and elsewhere.:

TABLE V.

| | Northumberland and Durham. | | | South Wales. | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Best house. | Steam. | Coking. | Steam. | Anthracite. | Derbyshire house and coking. | Scotland. Eglinton. | Lancashire. Ince Hall Arley. | Borneo. | Van Diemen's Land. | Trinidad. |
| Carbon | 843 | 787 | 868 | 807 | 923 | 799 | 801 | 826 | 703 | 802 | 652 |
| Hydrogen | 55 | 60 | 50 | 57 | 30 | 48 | 65 | 59 | 54 | 30 | 43 |
| Oxygen | 62 | 101 | 52 | 24 | 26 | 110 | 80 | 74 | 192 | 48 | 217 |
| Nitrogen | 21 | 24 | 10 | 13 | 6 | 12 | 16 | 18 | 7 | 14 | 13 |
| Sulphur | 12 | 15 | 9 | 44 | — | 7 | 14 | 8 | 12 | 19 | 7 |
| Ash | 7 | 13 | 11 | 55 | 15 | 24 | 24 | 15 | 32 | 87 | 68 |
| Total | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| Coke pr ct | 750 | 606 | 721 | 751 | 921 | 578 | 549 | 640 | — | — | — |

Having now shown the chemical composition of the chief descriptions of fuel, it will be desirable, for the purpose of illustrating their distinctive value, to compare their calorific power, and that of their constituents. This is done in several ways in the following table, on referring to which it will be seen that hydrogen has by far the highest heating power, hence some coal has more capacity for generating heat than pure carbon. The whole of the hydrogen, however, is not utilized, since, when oxygen exists with hydrogen in any fuel, they form water in the act of combustion, and only the surplus is available.

TABLE VI.

| | Composition of fuel. | | | Calorific power. | | | |
|---|---|---|---|---|---|---|---|
| | Carbon. | Hydrogen. | Oxygen. | Heat in degs. F., to which 1lb of water will be raised by 1lb of the fuel in conjunction with oxygen. | Relative. | Lbs. of water heated from the freezing point to 212° F. by 1lb fuel. | Lbs. of water at 212° F. converted into steam by 1lb fuel. |
| Hydrogen | — | 1·00 | — | 62,032 | 4,265 | 344·6 | 62·6 |
| Light carburetted hydrogen | ·75 | ·25 | — | 23,513 | 1,816 | 146·7 | 26·7 |
| Olefiant gas | ·86 | ·14 | — | 21,344 | 1.466 | 118·5 | 21·5 |
| Carbon burning to carbonic acid | 1·00 | — | — | 14,544 | 1,000 | 80·8 | 14·7 |
| Carbon burning to carbonic oxide | 1·00 | — | — | 4,453 | 306 | 24·7 | — |
| Carbonic oxide | ·43 | — | ·57 | 3,116 | 214 | 17·3 | 3·1 |
| COAL. | | | | | | | |
| Average Welsh | ·838 | ·043 | ·041 | 14,833 | 1,020 | 82·4 | 15·0 |
| " Newcastle | ·821 | ·053 | ·057 | 14,796 | 1,017 | 82·3 | 14·9 |
| " Scotch | ·785 | ·056 | ·097 | 14 150 | 973 | 78·6 | 14·3 |
| " Derbyshire | ·795 | ·049 | ·101 | 13,919 | 956 | 77·3 | 14·1 |
| " Lancashire | ·779 | ·053 | ·095 | 13,890 | 955 | 77·2 | 14·0 |
| Coke | ·94 | ·0004 | ·007 | 13,197 | 900 | 72·7 | 13·2 |
| Peat, dry | ·60 | ·06 | ·31 | 10,152 | 694 | 56·4 | 10·3 |
| Wood, dry | ·50 | ·06 | ·41 | 8,029 | 551 | 44·5 | 8·1 |
| Phosphorus | — | — | — | 13,500 | 929 | 75·0 | 13·66 |
| Naphtha | — | — | — | 13,208 | 909 | 73·2 | 13·4 |
| Alcohol | — | — | — | 12,931 | 889 | 71·8 | 13·1 |
| Sulphur | — | — | — | 4,032 | 277 | 22·4 | 4.1 |

The difference in value of the several samples of coal is interesting, and seems in favor of the Welsh and Newcastle coal, which are the only coals having a higher heating power than pure carbon. It will be observed that, with the exception of the Derbyshire coal, the calorific power varies with the proportion of carbon. In the case of Derbyshire coal, the oxygen is in such excess that it absorbs a large portion of the hydrogen to form water. For the same reason, the heating power of coke is less than that of coal, owing to so large a proportion of hydrogen being driven off in the manufacture of the coke. The heating power of marsh gas, or light carburetted hydrogen, may be said to present an unfair comparison with coal, since the heating power of one pound of coal will be considerably greater than the power of the gas produced from it by distillation. This also applies to coke. One pound of coal having a heating power of 14,796, when made into coke, would have a power, supposing the production of coke to be 60 per cent., of only 13,197×.60=7,918.

The presence of oxygen in fuel acts in a twofold manner in reducing the calorific power, by reducing the actual amount of carbon and hydrogen, and by rendering part of that amount ineffective for generating heat.

Hydrogen in fuel is only useful for the development of heat, when the proportion of it contained in any combustible is in excess of one-eighth of the quantity of oxygen contained in the same combustible.—*The Colliery Guardian.*

# THE ENGINEERING AND MINING JOURNAL.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## The Spectroscope.

THE scientific discoveries which have been made by the use of this instrument, in the comparatively few years which have elapsed since its discovery, are so well known in the scientific world as to be at present the theme of many of our most popular and interesting lectures. Only a week or two since we published the lecture of Prof. ROSCOE a celebrated English optician, upon the application of the spectroscope to the Bessemer process.

In this lecture the speaker showed the practical value of the instrument in determining the action which takes place in the converter during the pneumatic process of the conversion of iron into steel. The same subject was also ably handled by Prof. J. M. SILLIMAN, Jr., of Lafayette College, Easton, Penn., in a paper read last summer, before the American Associations for the Advancement of Science, and likewise published at the time in our columns. It may perhaps be said that these observations have as yet led to but few discoveries of practical value, yet, at the same time, it must be borne in mind that they have extended our field of observation and enabled us to study phenomena which ordinarily escape us entirely, and hence may at any time yield results of great pecuniary as well as scientific value.

On two consecutive Thursday evenings, (April 27th and May 4th) the people of our sister (or rather daughter) city, Hoboken, have had an opportunity of listening to very able general lectures upon the subject of the spectroscope, by Prof. GEORGE F. BARKER, of Yale College.

The first lecture we were unfortunately unable to attend, but from what we heard at the second, we conclude that it consisted in a general introduction, in which something was said upon the subject of light, in order to make clear what was to follow in the second lecture. The audience was made acquainted with the undulatory theory, and the reason for the dispersion or decomposition of white light in passing it through a prism. The fact that a continuous spectrum can only be obtained from a heated solid, or a glowing liquid body, but not from an incandescent gaseous matter, was also shown, and the manner in which the presence of different substances may be determined if they could be converted into a gaseous form. Thus it was shown how the spectroscope is a valuable aid to the chemist, and has in fact been the means of discovering four new elements, viz., rubidium, cæsium, indium and thallium. These metals have since been found to be extensively distributed over the earth, but to have escaped detection by the ordinary methods of analysis, owing to their small percentage in any known substance.

In the second lecture the spectra of copper, thallium, sodium, strontium, zinc and magnesium were thrown upon the screen by the use of the electric lamp, and the characteristic line or lines of each clearly pointed out. Brass was then placed between the carbon points of the lamp, and the spectrum produced was seen to give the copper and zinc lines each as clearly as though the other was not present. A mixture of several chlorides was then volatilized and the various metals were shown to have their own bright lines, which did not in the slightest degree interfere with those of the others.

Solar light, when passed through a prism, was found by WOLLASTON to contain a number of *dark* lines, which were subsequently studied by FRAUENHOFER, who mapped several hundred of those that appeared to him the most distinct, and to the most prominent affixed letters, which have been retained to designate them. These lines received his name and are still known as FRAUENHOFER's lines. For a long time, however, no explanation could be given for the existence of these dark lines. It was reserved for KIRCHHOFF and BUNSEN in one of the grandest generalizations ever achieved by the human intellect, to form a theory which was afterwards conclusively proved to be correct. These observers first noticed the coincidence between the bright sodium line produced by burning that metal and one of the dark lines in the solar spectrum. For some time this was the only observed fact in this connection, and though it pointed to the probable existence of some relation between them, furnished no definite conclusions.

Later KIRCHHOFF determined to try to neutralize the dark lines in the solar spectrum by means of the bright sodium line artificially produced. This he attempted to do by first obtaining a solar spectrum, and then placing in front of the slit, through which the sunlight passed, a sodium flame. The result was astonishing. The line, instead of being thus neutralized and disappearing, became darker. The brighter the line produced by the sodium when the sunlight was excluded, the darker became the line in the combined spectrum. The phenomenon was explained by KIRCHHOFF upon the theory that a gas was capable of absorbing the very rays it would emit when in a state of incandescence.

From this as a starting point, the scope of the theory was extended beyond the globe which we inhabit, until it included in its embrace the entire universe. The first leap, however, was only as far as the sun, from which light travelling at the rate of a hundred and eighty-six thousand miles a second reaches us in about eight and a half minutes. This appears a great distance; but by the spectroscope we have been enabled to analyze bodies much more remote.

But to return to the dark lines of the solar spectrum: If, said KIRCHHOFF, we suppose the sun to be composed of two parts, a solid or liquid glowing mass in the centre, which by itself would give us a continuous spectrum, and a surrounding atmosphere of glowing gases, less intensely luminous and intercepting the rays, which they by themselves would emit if the more highly heated mass behind them were removed, we have explained all the phenomena as yet observed. This theory was exceedingly ingenious and very plausible; but still it was only a theory. It lacked the complete confirmation which science demands. It was necessary to prove that the sun was actually surrounded by an atmosphere of gas, which by itself would give bright lines. In order to observe this it was necessary to wait till the occurrence of a solar eclipse, when the moon would cut off the light which comes to us from the light-giving mass or photosphere of the sun, and leave apparent only that from the less luminous gaseous atmosphere or the chromosphere. Parties of scientific men were sent out by the governments of various civilized countries to test this wonderful theory at the eclipse which next succeeded the announcement of KIRCHHOFF's theory. If the theory was correct, at the moment of total obscuration bright lines should be seen in the spectrum of the light emitted. This moment was naturally awaited with great expectation and anxiety by the observers; at last it arrived, and each observer succeeded in noting the appearance and position of at least three bright lines, thus fully substantiating the theory of KIRCHHOFF, and completing the greatest scientific achievement of the century.

The spectroscope was also brought to bear upon the fixed stars, the spectra of which were found to contain dark lines or absorption bands, indicating the existence of a gaseous atmosphere or envelope around these bodies.

The nebular hypothesis of LAPLACE, which is doubtless familiar to our readers, has been objected to, on the ground that we could not prove the existence of nebulous matter at the present time. What have been called nebulæ by one generation of astronomers, have been resolved into separate stars by the more accurate and powerful optical apparatus of the following generation, until the fact of the existence of matter in this form was gravely doubted by the best astronomers. It is true that we still could see nebulæ that had not yet been resolved, but past experience seemed to point to their resolution as soon as telescopes giving distinctness of vision were produced. The light of these nebulæ was examined also by the spectroscope, and the spectra found to contain bright lines, showing that they were in fact bodies of glowing vapor or gas, which can never be resolved into anything else by the most perfect optical instruments. This removes one objection which has been urged against the nebular hypothesis, by showing that nebulæ exist even to this day, and hence may have existed since the creation.

The way in which the direction of up-thrusts and down-rushes of vapor in the sun are determined by means of the spectroscope rests upon the well-known fact, that if we approach the source from which vibrations are emanating, we shall encounter more vibrations in a given time than if we remain stationary; or, in other words, the vibrations will be shortened. The vibrations caused by the whistle of an approaching locomotive are shorter and more numerous than those of the same whistle when it is stationary or moving from us. If we know the speed at which sound travels, and the number of vibrations per second of the particular note produced by the whistle, and number of vibrations which reach the ear per second when the whistle is approaching or receding from us, we can compute the speed at which the locomotive is moving.

If we direct a telescope to a solar spot, and annex the spectroscope in such a way that the slit crosses the spot, and then examine the spectrum produced with reference to certain lines, we shall find them bent. We know that the greater the wavelengths the less the ray is refracted by passing through a prism, and hence, if the deflection of the line is towards the red end of the spectrum, we know that it is caused by a lengthening of the waves or by a down rush of vapor in the sun. If, on the other hand, the bend is towards the violet end of the spectrum, we know that it is caused by the shortening of the waves or an up-thrust of the vapor. The velocity of the movement is indicated by the amount of the bending in the lines, and was found in some cases to be as much as twenty-nine miles per second.

These, and other interesting applications of the spectroscope, were alluded to by Dr. BARKER in the lecture referred to above. Lack of time prevented the speaker from introducing other topics, or from enlarging as he would have liked, upon those mentioned. The experiments by which the lecture was illustrated were performed with the ease and accuracy which but few lecturers can acquire, even by long practice.

## EDITORIAL CORRESPONDENCE.

WILKESBARRE, May 17, 1871.

THE preliminary meeting to organize the American Institute of Mining Engineers was held last evening. The attendance was unexpectedly large, and the proceedings were harmonious. According to present appearances, the Institute is destined to have a vigorous and influential career. A noteworthy feature is the interest manifested by the owners and operators of mines, and by mining foremen, who are not strictly engineers. Provision is made in the rules for such persons, and all others who desire to be connected with the organization, by the establishment of a class of associates, having all the privileges of members, with a very few restrictions. It is ordained that the President, four out of the six Vice-Presidents, and six out of the nine Managers, shall be professional mining engineers, this term including metallurgical engineers also.

The rules adopted are based upon those of the North of England Institute of Mining Engineers, which appear to have successfully endured the test of long experience.

This morning the engineers are scattering themselves about Wilkesbarre and its neighborhood, to visit mines, works, and other points of interest. The headquarters of the Institute are at the handsome and commodious Wyoming Valley Hotel. It is like taking a delightful excursion merely to ascend to the top of the house and survey the beautiful expanse of the Wyoming Valley, embosomed in green hills, or even to sit upon the broad piazza, and contemplate the fair Susquehanna, which flows broadly by, a stone's throw from the hotel.

The list of those present at the preliminary meeting is as follows:

THOMAS PETHERICK, Scranton, Pa.
W. R. SYMONS, Pottsville, Pa.
THOS. S. MCNAIR, Hazleton, Pa.
DANIEL HOFFMAN, Pottsville, Pa.
S. H. DADDOW, St. Clair, Pa.
THOS. M. DROWN, Phila., Pa.
J. H. BRAMWELL, Dunbar, Pa.
WILLARD P. WARD, New York, N. Y.
ERNEST GAUJOT, Pottsville, Pa.
OGDEN HAIGHT, New York, N. Y.
R. C. NEAL, Bloomsbury, Pa.
J. M. SILLIMAN, Easton, Pa.
HENRY S. DRINKER, Phila., Pa.
FRED. MERCUR, Wilkesbarre, Pa.
W. B. HICK, Wilkesbarre, Pa.
T. M. WILLIAMS, Wilkesbarre, Pa.
LEWIS S. JONES, Wilkesbarre, Pa.
R. P. ROTHWELL, Wilkesbarre, Pa.
R. W. RAYMOND, New York, N. Y.
JAS. A. TIMPSON, 14 West Forty-sixth street, New York.
JAMES THOMAS, Wilkesbarre, Pa.
WM. H. STURTEVANT, Wilkesbarre, Pa.

A considerable number will arrive to-day, and many applications for membership have been received from persons not present. All suitable applicants, including those in attendance at this meeting, will be elected as associates; and the division into members and associates, that is to say, into professional engineers and others, will be provisionally made by the Council, and submitted for ratification to the August meeting of the Institute. This classification promises to be a matter of some difficulty, as the term engineer is not exactly defined either by the rules or by common usage.

R. W. R.

## A New Rock Drill for Boring Tunnels and Shafts.

THE project of tapping Lake Tahoe for the purpose of conveying an abundant supply of water to the extensive gravel-deposits between the North and Middle forks of the American river, in Placer county, California, will no doubt be carried out ere long. These deposits have long been known to be extraordinarily rich, but the lack of a sufficiency of water and proper fall have kept them dormant thus far.

Col. A. W. VON SCHMIDT, the well-known civil engineer of San Francisco, is the originator of the scheme, and his reputation is ample guarantee for its feasibility. Lately the project has been freshly agitated, and we are assured, that at present the chances of an early commencement on that important work are excellent. For the purpose of boring the long tunnel required through the Sierra, Col. VON SCHMIDT has invented a peculiar drilling apparatus, which has several new features, and which we will here describe in outline. A full description will be presented to our readers as soon as the promised drawings arrive.

The cutting part of the machine is an iron "wheel," on the edge of which diamond cutters are so affixed, that when the large "wheel" is set in rotation, the cutters, which revolve at the same time very rapidly, cut or scrape a clean slot two inches in width, of circular form, and eight feet in diameter, in the rock. Simultaneously a large borer in the middle of the cylinder drills the hole which is to receive the blast. The

whole machine is intended to be run by compressed air. As soon as a sufficient depth, say three or four feet, is attained, the "wheel" is drawn back, the charge is inserted in the centre hole, and the explosion tears out the entire rock as far as exposed by the slot; or at least cracks it so that little exertion is required to remove it. For this purpose the lower half of the back of the cylinder opens on hinges, and through the opening a car is run to the front on a track. As soon as the debris are removed, the machine advances again and the work goes on.

We are not informed if this machine has been practically tested. Theoretically there is no reason why it should not be a complete success. The progress to be made daily by the use of this instrument in the Sierra is expected to be at least from twelve to fourteen feet.

### The Manufactories of South St. Louis.

WHERE else in the United States is there a point possessing to a greater degree all the pre-requisites for successful manufacturing than the city of St. Louis? We have frequently alluded to our unsurpassed natural advantages for a great variety of manufactures, and have still to say that it is only a question of time as to the investment of capital and enterprise in establishments, the magnitude and aggregate productions of which will astonish not only those who consider us a community of old fogies, but we shall all wonder that these things were not accomplished long ago.

Three hours at Carondelet, last week, convinced us that we have, at least, one class of manufactories—iron furnaces—that will compare favorably with those elsewhere, and that they are managed by men thoroughly conversant with their business—men who are progressive, and not content with following in the wake of others, and running in the well-worn ruts of older establishments, are not only introducing all the modern improvements successfully applied elsewhere, but many of the features in one furnace are original with the proprietors and managers.

The Vulcan Iron Works, situated at the extreme Southern limit of the city, are, in several respects, the most complete and perfect works of the kind in the United States, and, when completed and in operation, will be the most extensive single manufacturing establishment in the Mississippi Valley.

Furnace number one has been in blast since the 14th of November, during which period it has yielded between 5,000 and 6,000 tons of pig iron, and is now turning out from 48 to 50 tons per day. The only drawback that has been experienced at these works has been due to defective machinery, which has caused the company a great deal of trouble and expense. To remedy this defect, the company are now having constructed by TAPPEN & Co., of Pittsburgh, one of the largest blowing engines in the United States, which will be in operation about 1st Oct. The dimesions of this vertical engine—of the J. P. MORRIS & Co. type—will be 46 ft. perpendicular height, with blowing cylinder 9 ft. diameter and 9 ft. stroke; steam cylinder 9 ft. stroke and 60 inches diameter. Her two fly-wheels will weigh from 25 to 30 tons each. Her housing will be of immense cast-iron semi-circles, forming a complete circle at the top, and will be 25 ft. in height, on which the blowing cylinder will rest. The cross-heads, shafts, connecting-rods, and all other gearing and parts of whatever kind, will be in the same grand proportion, and executed in the best manner. This will be a low-pressure condensing engine, the condenser being of a new kind, much more simple and efficient than the old style. It will make from 18,000 to 20,000 ft. of cubic air per minute, and will run with from 20 to 30 pounds of steam, thus permitting the surplus gas to be utilized for other purposes. This will be far more economical than any high pressure engine, and far less liable to accident.

Furnace number two has been thoroughly overhauled, and some new and original features introduced worthy of note: *Firstly*, Water-backs or jackets, exterior to the brick-work and inside the columns—probably the first introduced in the United States. These water-backs consist of wrought or cast-iron, with water compartments running through them. This improvement checks or modifies the destruction of the fire-brick, and renders the breaking out of the liquid iron almost an impossibility. *Secondly*, Each tuyere has a cast-iron arch, with coiling gas-pipe through it, which penetrates the brick-work three or four inches, thus preventing the interior brick-work from burning too rapidly, keeps the tuyere cool, and renders it impossible for any cinders or other liquid matter to come out around the tuyers or breast. *Thirdly*, The tuyers are four feet from the base of the hearth, being higher than any other furnace in the United States of the same dimensions. Two material advantages gained by this extra elevation are: 1st. The tuyers cannot come in contact with the liquid, molten iron being above it; and 2d. The blast has free access for its full force of combustion, having no cinder or other liquid matter to interrupt the blast or absorb its power. A fire-brick furnace-hearth has been built in this number two furnace, and is probably the first one in the Nnited States. It consists of six concave courses of nine-inch fire-brick, on their ends, so arranged that it is impossible for any of the brick to float, or get dislocated, and they must remain in place and be worn away gradually by use and heat. It is assumed that this kind of hearth will far surpass that of sandstone or granite in point of durability, and that at no distant day fire-brick will be used exclusively for furnace-hearths. Hence the importance of the result of this test. Fire-brick are abundant and cheap, and the saving will be from twenty-five to thirty-three per cent. on the cost of either sandstone or granite. Number two furnace, which has been repaired, as above described, has been inspected by several iron men of Pennsylvania, who pronounce it the most complete furnace they have seen on this continent. This furnace will be put in blast some time this week, or early next week.—*Abridged from the Journal of Commerce.*

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114,743.—PAPER-BAG MACHINE.—Alfred Adams, Chagrin Falls, Ohio.

114,744.—APPARATUS FOR CARBURETING HYDROGEN GAS.—Jacob Ambuhl, Morristown, Pa.

114,745.—CAR-REPLACER.—Charles C. Ash, Manor Hill, Pa.

114,746.—CARRIAGE-HOLDBACK.—William Rondeau Baker, Wellington Square, Canada.

114,747.—HARVESTER.—John Barnes, Rockford, Ill.

114,748.—SHUTTER-WORKER.—Henry H. Barr, Harrisburg, Pa., assignor of one-half his right to John Kerper, same place.

114,749.—HARVESTER-BINDER.—Joseph Barta, La Crosse, Wis.

114,750.—STICKING OR ADHESIVE PLASTER.—Jenyns C. Battersby, New York, N. Y.

114,751.—CARRIAGE TOP.—William Bauder, Circleville, Ohio.

114,752.—PAPER BOX.—Peter Beer, Detroit, Mich.

114,753.—COAL-SCREEN.—Elbridge G. Belknap, Philadelphia, Pa.

114,754.—GEARING FOR OPERATING DRILLS.—Ambrose Blatchly, San Francisco, Cal.

114,755.—CAR-COUPLING.—Edward Bolman and George Simpson Watson Clarke, Halifax, Nova Scotia.

114,756.—LOOM.—Samuel Boorn, Lowell, Mass.

114,757.—TICKET-BOX.—Nathan C. Burson and John W. Robertson, Onarga, Ill.

114,758.—RAILWAY-CAR COUPLING.—Peter Campbell, Carrolltown, Pa.

114,759.—COMBINED TOOL.—George J. Capewell, Cheshire, Conn.

114,760, antedated May 12, 1871.—COTTON-BALE TIE.—William J Carroll, Natchez, Miss.

114,761.—CEMENT FOR COATING AND SEALING COFFINS, &c.—Isaac Charles, Alleghany City, Pa.

114,762.—GRATE FOR STOVES, &c.—John Churchman, Burlington, N. J., assignor to himself and Carbon Stove Company, same place.

114,763.—ENAMELING GAS-RETORT, &c.—Decius W. Clark, Chicago, Ill.

114,764.—WASHING MACHINE.—Nathan Gove Clary, Northfield, Minn.

114,765.—MACHINE FOR MORTISING BLIND-STILES.—Laroe M. Collins, Lebanon, N. H.

114,766.—LAMP-SHADE.—Michael H. Collins, Chelsea, Mass.

114,767.—CULTIVATOR.—John H. Conley, Moingona, Iowa.

114,768.—SCROLL-SAWING MACHINE.—George Cooke, Napier, Canada.

114,769.—FIRE-PROOF ROOFING.—John B. Cornell, New York, N. Y.

114,770.—COMBINED TOOL.—John W. Currier, Newbury, Vt.

114,771.—ELECTRIC TELEGRAPH.—Ludovic Charles Adrian Joseph Guyot D'Arlincourt, Paris, France.

114,772.—FEEDER FOR WAX TAPERS.—Samuel G. Dare, New York, N. Y.

114,773, antedated May 1, 1871.—ELASTIC TYPE.—Henry J. Davies, New York, N. Y.

114,774.—REVERBERATORY FURNACE.—Joseph Davis, Pittsburg, Pa., assignor, by mesne assignment, to himself, John Rigby, and A. Filson Dalzell.

114,775.—ACID-BOTTLE FOR FIRE-EXTINGUISHERS.—John C. Davison, Chicago, Ill.

114,776.—PURIFYING WATER FOR USE IN STEAM-BOILERS, &c.—George C. Louis Degenhardt, Williamsburg, N. Y.

114,777.—RECLINING CHAIR.—Edward Dietz, Philadelphia, Pa.

114,778.—SCROLL-SAWING MACHINE.—William H. Dobson, Rochester, N. Y.

114,779.—MOLDING-PLANE.—John E. Donaldson, Montezuma, Ind.

114,780.—KILN FOR REBURNING BONE-BLACK.—Edward P. Eastwick, Baltimore, Md.

114,781.—SPINNING-TOP.—Philip Eley, New York, assignor to Isaac Cole, Brooklyn, N. Y.

114,782.—DOOR-BOLT.—Ferd. Engelbrecht, Memphis, Tenn.

114,783, antedated May 2, 1871.—SLEIGH-VELOCIPEDE.—William Erd, New Ulm, Minn.

114,784.—COMPOUND FOR CURE OF CHILLS AND FEVER.—William P. Fennell, Louisville, Ky., assignor to Margaret Fennell, same place.

114,785.—CHURN.—John E. Finley, Memphis, Tenn.

114,786.—STEREOTYPE-BLOCK.—James Fish, Chicago, Ill.

114,787.—APPARATUS FOR CARBURETING AIR.—R. Berkeley Fitts, Philadelphia, Pa., assignor to himself, George W. Waitt, and William Rogers, same place.

114,788.—COOKING-STOVE.—Benjamin G. Fitzhugh, Frederick, Md.

114,789, antedated May 11, 1871.—GRAIN-SEPARATOR.—Peter Flickenger, Hanover, Pa.

114,790.—PRINTING TELEGRAPH APPARATUS.—Theodore M. Foote, and Charles A. Randall, Brooklyn, E. D., N. Y.

114,791.—PRINTING TELEGRAPH APPARATUS.—Theodore M. Foote, and Charles A. Randall, Brooklyn, E. D., N. Y.

114,792.—PRINTING TELEGRAPH APPARATUS.—Theodore M. Foote, and Charles A. Randall, Brooklyn, E. D., N. Y.

114,793.—PRINTING TELEGRAPH.—Theodore M. Foote, and Charles A. Randall, Brooklyn, E. D., N. Y.

114,794.—THRASHING-MACHINE.—John Foreman, Heraldsburg, Cal.

114,795.—STOCK-CAR.—George Washington Fox, Laramie, Wyoming Ter.

114,796.—WAGON-BRAKE.—Nathaniel Frey, Erie, Pa.

114,797.—CAR-COUPLING.—Emanuel M. George, Three Rivers, Mich.

114,798.—COMPOUND FOR PRESERVING FRUIT-TREES.—Leander C. Gifford, Monticello, Ill.

114,799.—MEAT-CHOPPER.—Jacob L. Good, Elizabethtown, Pa., Assignor to himself, and Jacob Dyer, same place.

114,800.—JOINER'S CLAMP.—William H. Goodchild, Centreville, N. J.

114,801.—JOINER'S CLAMP.—William H. Goodchild, Centreville, N. J.

114,802.—STILL FOR HYDROCARBONS.—John Gracie, Pittsburg, Pa., assignor to Lockhart, Frew & Co., same place.

114,803.—STILL FOR OIL.—John Gracie, Pittsburg, Pa.

114,804.—AUTOMATIC WATER-VALVE.—Joseph Guild, Buffalo, N. Y.

114,805.—LAMP-BURNER.—Elias J. Hale, Foxcroft, Me.

114,806.—STOVE-PIPE DAMPER.—Eli B. Hall and Daniel A. Keyes, Norfolk, Conn.

114,807.—PROJECTILE.—Edward Clinton Hancock, New Orleans, La.

114,808.—WAGON-STANDARD.—Josiah Harding, Ainsworth, Iowa.

114,809.—MACHINE FOR SCOURING, POLISHING AND GLASSING LEATHER.—Dennis Harrington, Boston, Mass.

114,810.—COMPOUND FOR THE CURE OF CANCER.—James Harrison, Castalia, N. C.

114,811.—SIGN.—James Harrison, New York, N. Y.

114,812.—SPRING GUARD FOR LEGS OF FURNITURE.—Daniel F. Hartman, Charles City, Iowa.

114,813.—SRING-HINGE.—David B. Hawkes, Providence, R. I., assignor to George E. Lucas, same place.

114,814.—DOVETAILING MACHINE.—Elander Heath, San Francisco, Cal., assignor to S. W. Shaw, William E. Brown, and Leonard Goss.

114,815.—NEEDLE-SETTER, NEEDLE-SHARPENER, NEEDLE-CASE, AND RIPPER.—Eli E. Hendrick, Carbondale, Pa.

114,816.—CARRIAGE-JACK.—David Hiestand, Pughtown, Pa.

114,817.—VISE.—Frank Higel, Philadelphia, Pa., assignor of one-half his right to James A. Weir, same place.

114,818.—BABY'S TRAVELING AND TOILET-CHAIR.—Esther Hoare, Dedham, Mass.

114,819.—ADJUSTABLE BOLSTER FOR BEDSTEADS.—Jacob Hoffman, Chicago, Ill.

114,820, antedated May 10, 1871.—COMBINED PUNCH, AWL, AND KNIFE.—H. S Holmes and D. Williams, South Boston, Mass., assignors to David Williams.

114,821.—TRANSIENT-BOLT FOR VEHICLES.—Charl Gustaf Orebro, Sweden.

114,822.—PLOW-COLTER.—Horace S. Hoxie, Raisin Centre, Mich.

114,823.—PRESSER-FEET FOR SEWING-MACHINES.—Thomas Hudson, Troy, N. Y.

114,824.—FILE.—Amasa Hyland, Hingham, Mass.

114,825.—RACK-PULLEY, SHADE-FIXTURES.—Willis Johnson, Waterbury, Conn.

114,826.—WASHING-MACHINE.—George F. Jordan, Gardiner, Me.

114,827.—HARVESTER-RAKE.—Dennis A. Kellogg, Valparaiso, Ind.

114,828.—UMBRELLA.—Robert P. Knapp, New York, N. Y.

114,829.—BOX STEREOSCOPE.—William M. Kohl, Cincinnati, Ohio.

114,830.—TREADLE.—Charles P. Leavitt, New York, N. Y.

114,831.—APPARATUS FOR EVAPORATING AND CONCENTRATING BRINE AND OTHER LIQUIDS.—Robert Gilmour Leckie, Acton Vale, Canada.

114,832.—MARINE LOCOMOTIVE.—Severre Lee, New York, N. Y., assignor to himself and James D. Reymert, same place.

114,833.—SAW-MILL.—Charles Enos Lewis, Bay City, Mich.

114,834.—THRASHER AND GRAIN-SEPARATOR.—William C. Leyburn, Sparta, Wis.

114,835.—SCROLL-SAWING MACHINE.—Sylvester G. Mason, Rochester, N. Y.

114,836.—DAIRY-HEATER FOR HEATING WATER.—George W. McCammon, Manheim, and David H. Burrell, Little Falls; said McCammon assigns his right to Rodney S. Whitman, Little Falls, N. Y.

114,837.—FIRE-BOX FOR HEATING STOVES.—William L. McDowell, Philadelphia, Pa.

114,838.—COOKING-STOVE.—William L. McDowell, Philadelphia, Pa.

114,839.—APPARATUS FOR AERATING BEER-BARRELS.—Joseph Metzger, East Cambridge, Mass.

114,840.—WASHING-MACHINE.—Laurence R. Mills, Tekonsha, Mich.

114,841.—KEEPER FOR BOLTS.—John M. Mitchell, Cincinnati, Ohio.

114,842.—SASH-HOLDER.—John H. Morse, Peoria, Ill.

114,843.—CURTAIN-FIXTURE.—Benjamin Moser, Waltham, Mass.

114,844, antedated May 15, 1871.—GLOBE-VALVE.—Matthew Murphy, Charlotte, N. C.

113,845.—WHIP-SOCKET.—James Nellis, Ypsilanti, Mich.

114,846.—SPARK-ARRESTER.—Michael O'Connor, Bangor, Mich.

114,847.—FOOT-BRUSH.—John W. Osborne, Brooklyn, N. Y.

114,848.—AMALGAMATING THE PRECIOUS METALS AND PREVENTING THE LOSS OF MERCURY.—Josiah S. Phillips, San Francisco, Cal.

114,849.—HYDRAULIC-PRESSURE ALARM.—Joseph L. Pillsbury, Columbus, and John S. Shorb, Canton, Ohio.

114,850.—TYPE-SETTING MACHINE.—Thomas J. Plunkett, New York, N. Y.

114,851.—GIRDER-REST FOR TIMBERS.—Jonathan Preston, Boston, Mass.

114,852.—CURTAIN-FIXTURE.—L. Corydon Prindle, Chicago, Ill.

114,853.—DEVICE FOR SECURING HORSE-POWERS.—Francis W. Randall, Burlington, Assignor to George W. White, Grass Lake, Mich.

114,854.—"FIX" FOR PUDDLING AND OTHER FURNACES.—Abram Reese, Pittsburg, Pa

114,855.—PLOW.—Thomas H. Reynolds, Rome, Ga.

114,856.—FINGER-RING.—Henry P. Richmond and Thomas E. Carpenter, Providence, R. I.

114,857.—TOGGLE-PIN FOR NAIL-MACHINES.—William H. Ridley, Pittsburg, Pa.

114,858.—HOUSING FOR ROLLS.—John Rigby, Pittsburg, Pa., assignor, by mesne assignments, to himself, Joseph Davis, and A. Filson Dalzell.

114,859.—DOVETAILING MACHINE.—John B. Ritchey, Pomeroy, Ohio.

114,860.—KETTLE-HANDLE.—Horace T. Robbins, Hyde Park, Mass.

114,861, antedated May 12, 1871.—REGULATING CUT-OFF VALVE-GEAR.—Stillman W. Robinson, Champaign, Ill.

114,862.—SEWING-MACHINE FOR BOOTS AND SHOES.—Nathan M. Rosinsky, New York, N. Y.

114,863.—STEAM-MANGLE.—Peter Rundquist, New York, N. Y.

114,864.—NON-CORROSIVE METAL-COATED PLATE-HOLDER.—James F. Ryder, Cleveland, Ohio.

114,865.—STEAM-VALVE AND GOVERNOR.—Robert Sanderson, Cleveland, Ohio.

114,866.—MODE OF APPLYING MOTIVE POWER.—John Schley, Savannah, Ga.

114,867.—FRUIT-PARER.—Robert P. Scott, Cadiz, Ohio.

114,868.—MANUFACTURE OF PAPER BOARD.—Edmund A. Seeley, Scotch Plains, N. J.

114,869.—SCHOOL-DESK AND SEAT.—Henry G. Sellman, North Newburg, Mich.

114,870.—MECHANICAL MOVEMENT.—Abram Shear, Plymouth, Mich.

114,871.—ENVELOPE.—Eldridge J. Smith, Washington, D. C.

114,872.—GAS-RETORT.—James H. Smith, Newark, Ohio.

114,873.—CHURN.—Ben H. Steele, Barnesville, Ohio.

114,874.—HORSE-POWER.—Henry B. Stevens, Buffalo, N. Y., assignor to George L. Squier, same place.

114,875.—SHUTTER-WORKER.—Frederick Strattner, Wilmington, Del.

114,876.—STEAM-BOILER.—Daniel Sullivan, Bangor, Me.

114,877.—RAILWAY-AXLE BOX.—John B. Sutherland, Detroit, Mich.

114,878.—EXCAVATOR.—Thomas Symonds, Portland, Me.

114,879.—HAND-STAMP.—Charles G. Taft, Jr., Norton, Mass.

114,880.—TREATMENT OF PAPER AND PAPER-PULP.—Thomas Taylor, Grove End Road, England, assignor to Edmund S. Hanna, and Waldimer, A. Schmidt, Pittsburg, Pa.

114,881.—SEEDING-CULTIVATOR.—Nelson S. Thompson, Richmond, Ind.

114,882.—MACHINE FOR BRUISING MALT.—James Flower Tibble, Detroit, Mich.

114,883.—SMOKE-STACK.—Wenxel Toepfer, Milwaukee, Wis., assignor to Toepfer & Son, same place.

114,884.—BRICK-MACHINE.—James V. Tompkins, Canandaigua, assignor to himself and John Cavender, Adrian, Mich.

114,885.—COMBINED CARRIAGE-BOW COVER AND SLAT-IRON.—Isaac N. Topliff, Elyria, Ohio.

114,886.—PAPER-RULING MACHINE.—James Tregurtha, Charlestown, Mass., assignor to George H. Sanborn, Brooklyn, N. Y.

114,887.—WRAPPER-CUTTER.—John R. Tunnicliff, Van Hornesville, N. Y.
114,888.—MACHINE FOR STRIPPING AND BOOKING TOBACCO.—John R. Tunnicliff, Van Hornesville, N. Y.
114,889.—COTTON-CHOPPER.—Edward Berriam Turnipseed, Columbia, S. C.
114,890.—MILLSTONE-BALANCE.—George Thomas Clark, Kalamazoo, Mich., Administrator of William A. Vance, deceased.
114,891.—ROASTED WHEAT.—George W. Waitt, Philadelphia, Pa., assignor to himself and Robert S. Fitts, same place.
114,892.—APPARATUS FOR ROLLING METAL.—Charles While, William Lewis, Thomas Strickland, and Samuel Caddick, Spuyten Duyvil, N. Y.
114,893.—PENCIL-HOLDER.—Horace J. Wickham, Manchester, assignor to Jeremy W. Bliss, Hartford, Conn.
114,894.—MEASURING-PAIL.—John B. Wightman, Brooklyn, N. Y.
114,895.—WOOD PAVEMENT.—Richard H. Willet, Washington, D. C.
114,896.—MILLSTONE-DRESS.—James Wilson, Davis' Mills, Va.
114,897.—LUMBER-RACK.—Robert B. Woodcock, Grand Rapids, Mich.
114,898.—FANNING-MILL.—Peter Young, Austin, Minn.
114,899, antedated May 5, 1871.—WINDMILL.—Samuel M. Abbott, Wilmington, Ill.
114,900.—MOLDING-MACHINE.—Joseph Albright, Midway, Tenn.
114,901.—PREPARATION OF TOBACCO FOR CHEWING.—David Alonzo, Alden, Malden, Mass.
114,902.—STEAM-RADIATOR.—Valerius D. Anderson, Kewanee, Ill.
114,903.—PIPE-COUPLING.—Valerius D. Anderson, Kewanee, Ill.
114,904.—WATER AND DRAIN-PIPE.—Thomas J. Barron, Brooklyn, N. Y.
114,905.—MOLD.—Thomas J. Barron, Brooklyn, N. Y.
110,906.—WICK-REGULATOR FOR LAMPS.—Henry Beebe, Jersey City Heights, N. J.
114,907.—TABLE FOR MAKING WAINSCOTING.—John W. Boughton and Elisha Chas. Hussey, New York, N. Y.
114,908.—CORN-PLANTER.—William C. Bowman, Clarksburg District, Md.
114,909.—TOP-PROP FOR CARRIAGES.—Frederick A. Bradley, New Haven, Conn., Assignor to O. B, North & Co., same place.
114,910.—DOOR-LATCH.—Elias K. Breckenridge, West Meriden, Conn.
114,911.—GALVANIC BATTERY.—David Brooks, Philadelphia, Pa.
114,912.—BEE-HIVE.—James F. Broomfield, Richmond, Ky.
114,913.—WHIFFLETREE.—William S. Brown, Thornton, Ind.
114,914.—PROPULSION OF VESSELS.—Patrick Burke, Boston, assignor to Willard M. Harding, Chelsea, Mass.
114,915.—WINDOW-SASH—Albert Gibbons Buzby, Philadelphia, Pa.
114,916.—COOLER FOR LIQUIDS.—John W. Campbell, Sr., New York, N. Y.
114,917, antedated May 12, 1871.—CURTAIN-FIXTURE.—Nathan Campbell, Rochester, N. Y.
114,918, antedated May 12, 1871.—CURTAIN-FIXTURE.—Nathan Campbell, Rochester, N. Y.
114,919.—WHEEL FOR TEMPERING CLAY.—Franklin L. Carnell, Philadelphia, assignor to himself and David R. Carnell.
114,920.—MACHINE FOR POINTING HORSESHOE NAILS.—Alexander Caryl, Groton, Mass.
114,921.—SAW-FILING MACHINE.—Charles P. Case, Troy, Pa.
114,922.—CHURN.—Schuyler S. Case, Marion, N. Y.
114,923.—BED AND SEAT-SPRING.—James P. Chamberlin, North Abington, Mass.
114,924.—TELEGRAPH-INSULATOR.—Stephen Chester, Elizabeth, N. J.
114,925.—BREECHING-HOLDER FOR HARNESS.—Frederic L. Churchill and Robert C. Beach, Minneapolis, Minn.
114,926.—METHOD OF ATTACHING SAWS TO THEIR ARBORS.—George W. Colborn, Gardiner, Me.
114,927.—METALLIC SIGN.—Samuel Charles Collis, Philadelphia, Pa.
114,928.—BASE-BURNING STOVE.—Albert C. Corse, Troy, N. Y., Assignor to Eddy, Corse & Co., same place.
114,929.—LOOM.—Jeremiah Francis Crowley, Philadelphia, Pa.
114,930.—BREAD-SLICER.—John W. Currier, Springfield, Mass., Assignor to himself and W. Labaree, same place.
114,931.—CAN TOP.—Charles E. Dayton, Meriden, Conn.
114,932.—CIGAR-MOLD.—Napoleon Dubrul, Joliet, Ill.
114,933.—DASHER FOR WHEELED VEHICLES.—Willet Fisher, Marathon, N. Y., assignor to himself, Jerry C. Gray, and Jessie L. Judd, same place.
114,934.—CLOTHES-DRIER.—Marvin Flanders, Kendall, N. Y.
114,935.—SCREW-TAPS.—George H. Fox, Boston, Mass.
114,936.—RAILROAD SWITCH.—Samuel French, Boston, assignor to Sidney Allen, Newtonville, Mass.
114,937.—WAGON-JACK.—Abner R. Giles, Adams, N. Y.
114,938.—TELEGRAPH-REPEATER.—Elisha Gray, Chicago, Ill.
114,939.—PIPE-CUTTER.—Dennis Harrigan, North Somerville, assignor to himself and Joel Gay, Cambridge, Mass.
114,940.—RAILWAY GATE.—Simeon H. Heatwold, Bridgewater, Va.
114,941.—TANNING COMPOUND.—Allen Hisey, Tama city, Iowa.
114,942.—SASH-HOLDER.—Robert B. Hugunin, New York, N. Y.
114,943.—BASE-BURNING STOVE.—Zebulon Hunt, Hudson, N. Y.
114,944.—FLEXIBLE PROPELLER.—Robert Hunter, Cincinnati, Ohio.
114,945.—PROCESS OF COATING BILLIARD-BALLS, KNIFE-HANDLES, AND OTHER ARTICLES.—John W. Hyatt, Jr., Albany, N. Y.
114,946.—ARTIFICIAL STONE FOR BUILDINGS.—James J. Johnston, Columbiana, Ohio.
114,947.—BASE-BURNING STOVE.—William M. Jones, Horicon, Wis.
114,948.—BIRD-CAGE BRACKET.—Albert D. Judd, New Haven, Conn.
114,949.—MACHINE FOR LEVELING BOOT-HEEL TREADS.—Arza B. Keith, Braintree, Mass.
114,950.—APPARATUS FOR IGNITING GAS AND OTHER LIGHTS.—Wilhelm Klinkerfuer, Gottingen, Prussia.
114,951.—BREECH-LOADING FIRE-ARM.—James Lee, Milwaukee, Wis., assignor to Philo Remington, Ilion, N. Y.
114,952.—GRAIN-BAG HOLDER.—William P. Lelan, Mendon, Mich.
114,853, antedated May 12, 1871.—BORING MACHINE.—Robert Little, Freeport, Ill.
114,954.—LAMP.—Charles B. Mann and Stephen S. Mann, Baltimore, Md.
114,955.—SPRING BED-BOTTOM.—Calvin F. Manuel and Daniel M. Leonard, La Crosse, Wis.
114,956.—MANUFACTURE OF SHEET-IRON AND REMOVING SCALE FROM IRON FOR COATING WITH OTHER METALS.—Caleb Marshall, Philadelphia, Pa., assignor to Marshall, Philips & Co., same place.
114,957, antedated May 6, 1871.—FEEDING MECHANISM FOR FILE-CUTTING MACHINES.—Charles E. Moore, Boston, Mass., assignor to Hiram B. Nickerson, same place.
114,958.—CASTING CAR-WHEELS.—James K. Morange and Napoleon B. Morange, Pittsburg, Pa.
114,959.—CURRENT-WHEEL.—Clark Morehouse, Wayland, N. Y., assignor to himself and John W. Doughty, same place.
114,960.—EARTH-CLOSET.—Henry Moule, Fordington, and James Bannehr, Exeter, England, assignors to Earth-Closet Company, Hartford, Conn.
114,961.—FLOUR-SIFTER.—William B. Nichols, Seymour, assignor to himself and T. B. Carpenter, New Haven, Conn.
114,962, antedated May 6, 1871.—FILE.—Hiram B. Nickerson, Boston, Mass.
114,963.—BANK-CHECK, &c.—Anthony C. Paquet, Philadelphia, Pa.
114,964.—CULTIVATOR AND SHOVEL-PLOW.—George W. Parsons and William S. Finney, Harrisburg, Pa.
114,965.—BOILER-FURNACE DRAUGHT REGULATOR.—William Everett Pearson, East Boston, Assignor to himself and James C. Wilson, Lynn, Mass.
114,966.—FLOUR-BOLT.—Dabney N. M. Peregoy, Elizabethtown, Tenn.
114,967.—MILLSTONE-DRESS.—Dabney N. M. Peregoy, Elizabethtown, Tenn.
114,968.—COPYING COLORED AND DEFECTIVE DRAWINGS, &c.—Isaac Rehn, Washington, D. C., assignor to himself and Norris Peters, same place.
114,969.—PISTON AND PISTON-PACKING.—George H. Reynolds, New York, N. Y., assignor to himself, Cornelius H. Delamater, and Alexander K. Rider, same place.
114,970.—BOOT-JACK.—Milo A. Richardson, Sherman, N. Y.
114,971.—LARD PACKAGE.—John Ring, St. Louis, Mo.
114,972.—PRESERVING AND SMOKING MEAT.—Absalom Robertson, Seymour, Indiana.
114,973.—WAGON-BRAKE.—John J. Rose, Elmwood, Illinois.
114,974.—GRAIN-SEPARATOR.—Lewis C. Royer, Royerton, Ind.
114,975.—SKINNING-KNIFE.—Morgan Rufe, Doylestown, Pa.
114,976.—SLEIGH-BRAKE.—John W. Scott, Broad Top City, Pa.
114,977.—FANNING-MILL.—Hurlbert H. Seeley, Hudson, Mich.
114,978.—METAL-FOUNDERS' BLACKING.—John Carrington Sellars, Birkenhead, England.
114,979.—SELF-ADJUSTING CAR-WHEEL GEAR.—George Sewell, Brooklyn, N. Y.
114,980.—FLOUR-BOLTING REEL.—David Shamp, Perry, N. Y.
114,981.—FAUCET OR SUPPLY-COCK.—Edwin F. Shoenberger, Philadelphia, Penn.
114,982.—HITCHING-POST.—Edwin F. Shoenberger, Germantown, Pa., assignor to George K. Shoenberger, Jr., same place.
114,983.—CAR-BRAKE.—Calvin A. Smith, Jersey City, N. J.
114,984.—THRASHING-MACHINE AND GRAIN-SEPARATOR.—John Smith, Burlington, Wis.
114,985.—APPARATUS FOR COOLING AND PRESERVING MILK AND OTHER LIQUIDS.—Daniel E. Somes and Frank C. Somes, Washington, D. C.
114,986.—ADJUSTABLE SQUARE.—Knud Steen, Rochester, N. Y.
114,987.—RULE-JOINT.—D. H. Stephens, Riverton, Conn.
114,988.—DRAFT-EQUALIZER.—William Stephenson, Neponset, Ill.
114,989, antedated May 12, 1871.—PUMP.—Zara T. Sweet, Tiskilwa, Ill.
114,990.—WASHING AND WRINGING-MACHINE.—John Taber, South Wolfborough, N. H.
114,991.—NUT-LOCK.—Samuel I. Thompson, New Waterford, Ohio.
114,992.—KEY-FASTENER.—Lyman Tobey, Naples, N. Y.
114,993.—DOUGH-KNEADER.—William Tyler, Georgetown, D. C.
114,994.—MACHINE FOR SKIVING SOLES OF BOOTS AND SHOES.—Henry S. Vrooman, Boston, Mass.
114,995.—WAGON-BRAKE.—Henry Walmer, Lebanon, Pa.
114,996.—HYDRANT.—James Walsh, Philadelphia, Pa.
114,997.—TOBACCO-PIPE.—William Francis Warburton, Philadelphia, Pa.
114,998.—ICE-CREEPER.—Mahlon Warne, Philadelphia, Pa.
114,999.—MACHINE FOR PITCHING CASKS AND BARRELS.—Albin Warth, Stapleton, N. Y.
115,000.—LATHE FOR CUTTINGG GROOVES IN METAL ROLLERS.—Hervey Waters, Boston, Mass.
115,001.—SAFE-BOLT.—Jacob Weimer, New York, N. Y.
115,002.—MACHINE FOR MAKING CIGARS.—John Wettstein, Baltimore, Md., assignor to himself and John T. Heunaman, same place.
115,003.—RAILWAY ALARM FOR TRUCKS.—Francis E. Whiteside, Oxford, Pa.
115,004, antedated May 12, 1871.—COMBINED RAKE AND REEL FOR HARVESTERS.—John B. Whiting, Ripon, Wis.
115,005.—PAPER FOR BANK-NOTES, BONDS, &c.—James M. Wilcox, Glen Mills, Pa.
115,006.—SHUTTLE FOR LOOMS.—Daniel Wright, Waltham, Mass., assignor to Orlando A. Kneeland, same place.
115,007.—SELF-LOCKING SCREW-BOLT FOR SAFES.—Charles O. Yale, New York, N. Y.
115,008.—HAMMER.—Gottlieb M. Young, El Paso, Ill.
115,009.—MACHINE FOR CUTTING SCREW-THREADS ON BOLTS.—Orlando P. Briggs and Lewis W. Briggs, Chicago, Ill.

4,379.—HORSE-POWER.—Hiram Aldridge, Elizabethtown, N. M., assignor, by mesne assignments, to Cornelius Aultman, of Canton, Ohio.—Patent No. 68,829, dated September 17, 1867.
4,380.—GRINDING AND AMALGAMATING ORE.—Thomas Bates, Central City, Colorado Ter.—Patent No. 102,476, dated May 3, 1870.
4,381.—FABRIC FOR HEAD-COVERING.—Charles F. Bosworth, Milford, Conn.—Patent No. 38,806, dated June 9, 1863.
4,382.—PULLEY ATTACHMENT FOR RAISING WEIGHTS.—George W. Gregory, New York, N. Y.—Patent No. 57,125, dated August 14, 1866; antedated February 14, 1866; re-issue No. 2,784, dated October 22, 1867; reissue No. 2,939, dated May 19, 1868.
4,383.—CULTIVATOR.—Thomas McQuiston, Morning Sun, Ohio. Patent No. 25,843, dated October 18, 1859.
4,384.—PROCESS OF SEASONING LUMBER.—Henry H. Beach, Rome, N. Y.—Patent No. 107,854, dated October 4, 1870.
4,385.—LAMP-WICK FEEDER.—George Cade, Long Branch, N. J.—Patent No. 101,427, dated April 5, 1870,
4,386.—BASE-BURNING STOVE.—William J. Keep, Troy, N. Y. Patent No. 101,388, dated March 29, 1870.
4,387.—BASE-BURNING FIRE-PLACE HEATER.—David Stuart and Lewis Bridge, Philadelphia, Pa., assignors to David Stuart and Richard Peterson.—Patent No. 79,275, dated June 23, 1868; reissue No. 3,608, dated August 17, 1869.

## DESIGNS.

4,903.—SASH-HOLDER.—Edwin C. Heister and Gabril O. Heister, Reading, Pa.
4,904.—RUBBER ERASER.—Samuel D. Hovey, Brooklyn, N. Y.
4,905.—CARPET-PATTERN.—Archibald McCallum, Halifax, England, assignor to Joseph Wild, New York city.
4,906.—ORNAMENT FOR FOUNTAIN.—Jonathan Moore and William Wilkinson, Brooklyn, N. Y., assignors to Jonathan Moore and A. Horton, same place.
4,907.—ORNAMENT FOR FOUNTAIN.—Jonathan Moore and William Wilkinson, Brooklyn, N. Y., assignors to Jonathan Moore and A. Horton, same place.
4,908.—CARPET-PATTERN.—Edward Perrin, Kidderminster, England, assignor to W. & I. Sloane, New York city.
4,909.—CARPET-PATTERN.—Edward Perrin, Kidderminster, England, assignor to Joseph Wild New York city.
4,910.—COOKING-STOVE.—John R. Rose and Edward L. Calely, Philadelphia, assignor to Orr, Painter & Co., Reading, Pa.
4,911.—BRACELET.—Daniel H. Smith, Attleborough, Mass.
4,912.—CLOCK-CASE.—Walter L. Tyler, Bristol, Conn., assignor to the E. N. Welch Manufacturing Company, same place.
4,913.—BEDSTEAD-FASTENING.—Nehemiah C. Whitcomb, Oak Hill, N. Y.
4,914.—CARPET-PATTERN.—George Curtis Wright, New York, N. Y.
4,915.—JELLY-GLASS.—James S. Atterbury and Thomas B. Atterbury, Pittsburg, Pa.

## TRADE-MARKS.

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262.—SCISSORS.—Robert J. Roberts, New York, N. Y.
263.—LINIMENT.—John Schember, Bangor, Me.
264.—BOOTS AND SHOES.—Henry Elmer Townsend, Boston, Mass.
265.—BOOTS AND SHOES.—Henry Elmer Townsend, Boston, Mass.

## EXTENSIONS.

ARCHIBALD H. ROWAND, of Alleghany City, Pa.—Letters Patent No. 17,299, dated May 12, 1857.
ANN M. RODEFER, of Springfield, Ohio, administratrix of Joseph Rodefer, deceased.—Letters Patent No. 12,693, dated April 10, 1855.


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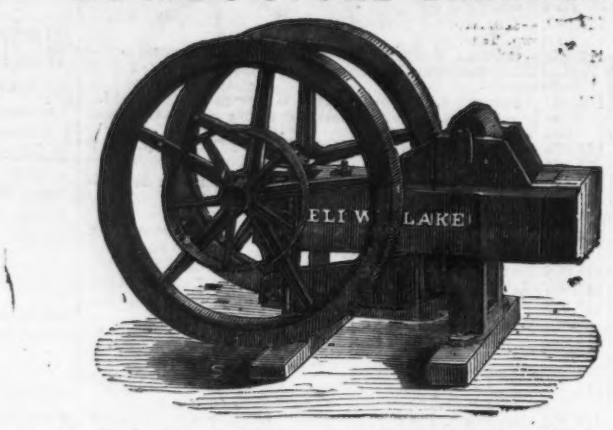


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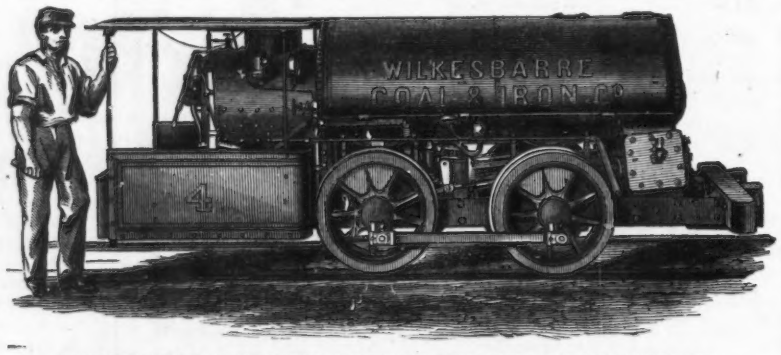


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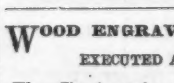

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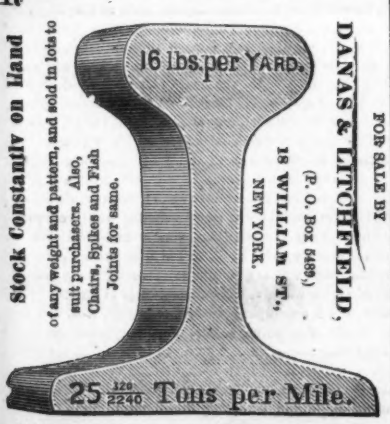
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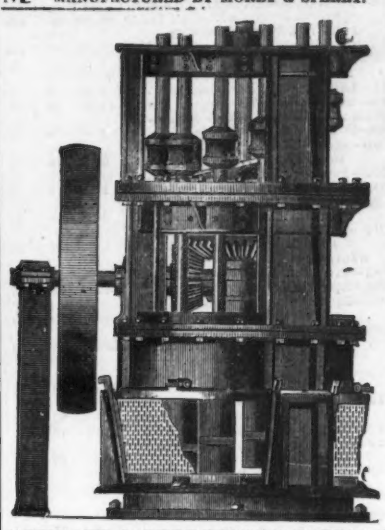

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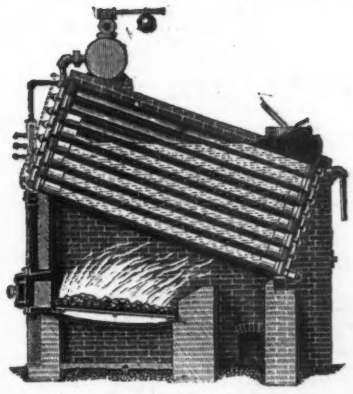

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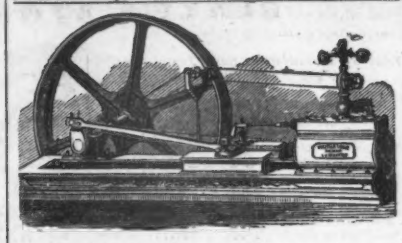

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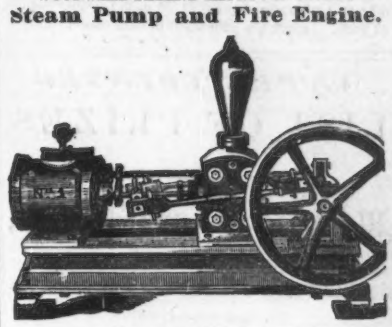

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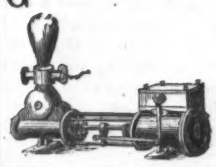

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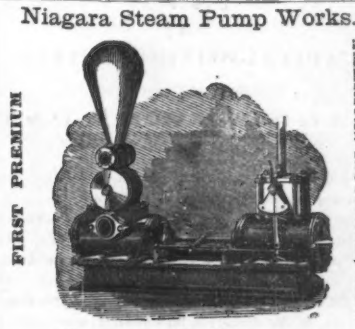


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| 157 | —A choice of Games and Toys, (see terms in special sheet) | | | |

*All paid through by mail or express.*

We have taken especial pains to select in making up our price list the NEWEST and very BEST articles. No charge will be made for boxing or packing any article on our list. The Premiums, Nos. **4** to **7** inclusive, **31** to **35** inclusive, **75 99, 101, 105** to **108** inclusive, **121** to **128** inclusive, **137** to **141** inclusive, **154, 156, 157,** will each be delivered FREE of charge by mail or express (at the Post-office or express office nearest recipient) to any place in the United States or Territories. The other articles cost the recipient only the freight after leaving the manufactory of each, by any conveyance specified.

As an aid to those who engage upon large clubs, we will count subscriptions by *one* individual for 1869, 1870, and 1871, as *three* subscribers toward a premium. Every *new* subscriber should have the work from the beginning. Bound volumes may be counted in the same way—each as one subscriber—except, of course, when they are obtained as a premium.

**Do not fail to note the following Points:**

1. All subscribers sent by one person count, though from one or a dozen different post-offices. But

2. State with each name or list of names sent that it is for a premium.

3. Send the names as fast as obtained, that the subscribers may begin to receive the paper at once. You can have any time, from one to six months, to fill up your list.

4. Send the exact money with each list of names, so that there may be no confusion of money accounts.

5. Old and new subscribers all count in premium clubs, but a portion, at least, should be new names; it is partly to get these that we offer premiums to canvassers.

6. Specimen numbers, cards, and show-bills will be supplied free, as needed by canvassers; but they should be used carefully and economically, as they are very costly.

7. Remit money in Checks on New York banks or bankers, payable to order of WESTERN & COMPANY, or send Post-Office Money Orders. If neither of these is obtainable, Register Money Letters, affixing stamps both for the postage and registry; put in the money and seal the letter in the presence of the postmaster, and take his receipt for it. Money sent in any of the above ways is at our risk.

## DESCRIPTIVE LIST OF PREMIUMS.

*Every Premium in the annexed list is described in the December* MANUFACTURER AND BUILDER, *and also in a* **Special Descriptive Sheet,** *which will be sent* **free** *to every one desiring it. We have room here for the following only:*

**No. 1—Chest of Good Tools.**—We are able, through the special favor of Messrs. Patterson Brothers, of 27 Park Row, to offer chests of the very finest quality of tools, of kinds and prices named below. Similar tools could be purchased for half the money; but these are all A No. 1, for practical use, and worth a dozen common articles. For this we have the guarantee of Messrs. Patterson, which is amply sufficient for us, and for all who know them. Any of these tools may be ordered of them. We make up only a single premium, which contains a full assortment for all common purposes. The tools are of regular size, and but few additions would be required for a journeyman carpenter. The assortment we offer is as follows: 1 tool-chest, $8; 1 jack-plane, $1 75; 1 smooth-plane, $1 50; 1 fore-plane, $2 25; 1 handsaw, 22 in., $1 75; 1 compass saw, 10 in., 50c.; compass, 6 in., 37c.; 1 adze-eye hammer, No. 4, $1 25; 1 hatchet, No. 2, 90c.; 1 draw-knife, 7 in., $1 12; 1 try-square, 6 in., 70c.; 1 bevel, 8 in., 75c.; 1 chalk-line and spool, 30c.; 1 mallet, 30c.; 1 pair of pliers, (steel,) 5 in., 60c.; 1 pair of calipers, 4 in., 35c.; 1 brace, No. 2, $2 25; 1 auger-bit, ea., ¼ in., 30c.; ½ in., 32c.; ¾ in., 45c.; 1 in., 60c.; 1 centre-bit, ea., ½ in., 21c.; ¾ in., 23c.; 1 in., 25c.; 1¼ in., 35c.; 1½ in., 40c.; 6 gimlet-bits, assorted, 90c.; 3 gimlet-bits, assorted, 33c.; 1 screw-driver bit, 25c.; 1 flat countersink, 25c.; rose, do., 25c.; snail, do., 25c.; 1 octagon reamer, 30c.; 1 taper-bit, 30c.; 1 screw-driver in handle, ea., 3 in., 30c.; 6 in., 50c.; 1 gouge in handle, ea., ½ in., 50c.; 1 in., 70c.; 1 chisel in handle, ea., ¼ in., 30c.; ½ in., 35c.; ¾ in., 40c.; 1 in., 50c.; 1¼ in., 60c.; 1 framing-chisel, ea., ¾ in., $1; 1 in., $1 10; 1¼ in., $1 20; 1 auger, ea., ¾ in., 70c.; 1 in., 80c.; 1¼ in., 90c.; 1 set bradawls in handles, $1 35; 1 rule, 2 feet, 25c.; 1 saw file, ea., 4 in., 14c.; 5 in., 17c.; 1 flat bastard file, 8 in., 30c.; 1 wood-rasp, 50c.; 1 soldering copper, 60c.; solder nails, etc., $1 25;=**$45 00.**

**Nos. 2, 3—Mathematical Instruments for Draughting, Drawing, Etc.**—Very convenient not only for architects and mechanics, but for boys and girls. These are neatly fitted in beautiful rose-wood cases, having dividers with flexible joints, and points, semi-circles, pencil and penholders, rulers, etc., etc. All the pieces in No. 2 are finished in brass and steel; those in No. 3 are German-silver and steel. The pieces are the same in each, but No. 3 is of extra beauty and workmanship. 18 subscribers at $1 50 each secures No. 2, and 22 at $1 50 each, No. 3.

**Nos. 4, 5, 6, 7—Pocket Knives.**—Here's for the boys and girls. These premiums are among the most pleasing and useful that we have ever offered. Every boy, and girl too, wants a pocket knife. We give them an opportunity to obtain a most valuable one for merely a little effort. These knives are from Messrs. Patterson Bros. No. 4 is a neat, substantial knife, with three blades and buck-horn handle. No. 5 is a still finer article, with four blades and buck-horn handle. No. 6 is an elegant knife, with four blades and shell handle. No. 7 is a lady's pocket-knife, a beautiful article, with four blades and shell handle.

**Nos. 8, 9, 10, 11, 12, 13—American Table Cutlery.**—We are glad to be able to offer really good articles of American manufacture, such as are competing successfully with the best foreign goods. ***Messrs. Patterson Bros., 27 Park Row,*** who supply us with these articles, are also importers of English goods. They recommend these knives, manufactured by the ***Meriden Cutlery Co.,*** as equal to any cutlery in the market, and their recommendation is a guarantee wherever they are known. We offer four kinds knives, and three sizes of each kind. No. 8 have rubber handles, which are actually boiling-water-proof, so that, if they were accidentally to remain in it for several minutes, or even hours, they would not be injured. The blades are of the best steel, and warranted Dessert size, with forks, sold at $14. For 23 subscribers at $1 50, or 78 at $1, we will give either the medium size or the table size, sold at $15 50. No. 9 have ivory handles, are selected with great care, have steel blades, and are beautiful goods. Dessert size, with forks, sold at $18 50. For 31 subscribers, at $1 50, or 100 at $1, we will send the medium size, sold at $20 50. For 34 at $1 50, or 112 at $1, we will send the table size, sold at $22 50. No. 10 are made of solid steel, and are triple-plated all over with pure silver, which will wear for a long time, while the knife is actually indestructible by ordinary use. Dessert size, with forks, sold at $22. For 37 subscribers, at $1 50, or 118 at $1, we will give the medium size, sold at $24 50. For 38 at $1 50, or 120 at $1, we will send the table size, sold at $25. For 38 at $1 50, or 120 at $1, we will send the table size, sold at $25, No. 11 have steel blades, triple-plated with silver, and larger ivory handles, and are really splendid goods. Dessert size, with forks, sold at $25 50. For 42 subscribers, at $1 50, or 128 at $1, we will give the medium size, sold at $28. For 45 subscribers at $1 50, or 143 at $1, we will give the table size sold at $30 50. The forks, which accompany these premiums, Nos. 8, 9, 10, are made of genuine albata, and warranted double-plated with coin-silver. The forks with No. 11 are warranted triple-plated with coin-silver. These forks are also furnished to us by Messrs. Patterson Bros. The carving-knife and fork, and fluted steel, are made by

the Meriden Cutlery Co., with the best ivory balanced handles.

**Nos. 14 to 20—Silverware for the Table.**—What would become of elegance and refinement in the furnishing of homes if the ladies (God bless them!) had not such an amiable passion for endlessly beautifying everything around them? Ever since Eve first set out the fruit of Paradise on its broad leaves to entertain the angel guests of Adam, it has been the province of her lovely daughters to spread the social board with attractions still more tempting to the eye than to the palate. What, that becomes a woman, will not a woman do to make her table shine? We condole with them that their means are not always equal to their good taste, and propose that henceforth no lady shall lack a lustrous silver tea-set, or other piece of similar elegance, unless she chooses to. Look at the following premiums, all of the celebrated manufacture of Messrs, HALL, ELTON, & Co., 36 Park Row, New York; No. 28 is silver-plated, gold-lined, beautifully chased **Tea Set** of six pieces, consisting of a coffee-pot, two teapots, a creamer, a sugar-bowl, and a slop-bowl. The style of this set is very neat, new and elegant. Messrs. Hall, Elton & Co, warrant these goods to be their best triple plate. This is a very desirable premium. No. 29 is a tea-set with same number of pieces, triple-plated, plain, new style.

**Nos. 31, 32, 33, 34, 35—GOLD PENS. Rubber Mounted with Ever-Pointed Pencils—Pens in Gold and Silver Holders—Pens and Pencils in Extension Cases.**—No. 31 has a gold-mounted rubber case, with pencil, and a No. 4 gold pen, manufactured by MABIE, TODD & Co., 180 Broadway, New York. This and the next, No. 32, are, we think, really the best things of the kind manufactured. The fact that hard rubber is used, shows that the gold for the mountings, etc., is of the finest quality, as rubber, on account of the sulphur contained in it, can not be mounted with any other without tarnishing. When closed, the pencil No. 31 is only 5 inches long, (No. 32, 3¼ inches,) but it opens to a length of 5¾ inches. The price for the holder and pencil of No. 31 is $6, pen $2; and of No. 32, or smaller size, $5 for the case, and $1 75 for the pen. Fifteen subscribers will give you the former, or gentleman's size, and 13 the latter, or lady's size. No. 33 is a No. 6 gold pen, with silver or gold-plated holder with an ebony handle—a very neat, desirable business-pen. By describing the kind of pen you prefer, we can probably select one that will suit your hand perfectly. We send these by mail, in a neat turkey morocco box, lined with velvet, in which they can be kept, protected from injury. No. 34 is a large pen, in a fine extension case, round or fluted, and richly engraved. The gold is 14 carats fine. These pens, which are nicely put up in boxes, are a very beautiful thing for a present. Price $20, and sent, postage paid, to any address, upon receipt of 29 subscribers at $1 50 each. No. 35 is a lady's gold pen, with ivory holder. Price, $2 75. This is indeed a very neat and beautiful pen for ladies' use. We send it, postpaid, by mail, inclosed in a handsome velvet-lined morocco box, for 6 subscribers.

**No. 38—The Celebrated St. Germain or German Student's Lamp.**—as it is sometimes called. This lamp is made and furnished to us by C. F. A. HINRICHS. It scarcely needs eulogium, being the standard thing in our leading colleges, both among students and professors. They reject gas, even where it is most plentiful and convenient, and save their much-worked eyes by the motionless pure white light for which this lamp is so remarkable. No other artificial illumination approaches so nearly to the still colorless sunlight. The secret is in the scientific adaptation of burner and chimney to produce that perfection of draught by which absolute combustion is attained without vibration. The porcelain shade softens the light most agreeably. The lamp slides on a vertical standard, and is adjusted by a set-screw at any desirable elevation to accommodate the work or the eyes. The reservoir is elevated above and at a short distance from the burner, (communicating by a pipe,) so that the oil is always cool and out of reach of flame. The reservoir can be taken out of its telescopic socket, and carried away to another room and filled and returned, without putting out the light. The lamp will be a treasure worth no little trouble to obtain to any one who needs strong light, or who values eye-sight, economy, neatness, pure air, and freedom from trouble and annoyance with lamps; as in all these points it is without a peer. The price of these lamps is $8, with 25 cents for packing. The mineral sperm oil can be had from most respectable dealers, or ordered in packages of any size (1 gallon upward) from Messrs. HENRY RUSSELL & Co., 38 Park Place, New-York.

**No. 39—Family Scales.**—These scales combining the advantages of counter and platform scales, are peculiarly adapted to household purposes. They weigh from ½ ounce to 240 lbs. They have a scoop or pan for weighing flour, sugar, and other house stores, and a platform for heavier articles, and are just such an apparatus as is needed for in-door or out-door use, occupying less than two feet square. These scales are manufactured by the well-known FAIRBANKS & Co., No. 252 Broadway New York, whose weighing apparatus has long ranked as the standard in all parts of the country. Send to them for circulars, if desired.

**Nos. 45.53—Bailey's Patent Planes.**—To those who have used these planes and know their value, is but small praise to say that they are superior to any others made. They are so far ahead of any others that there can be no comparison between them. They are self-adjusting in every respect. Both the wood and iron planes are entirely independent in themselves, requiring neither hammer, screw-driver, nor wrench to replace or adjust the cutter, which is held firmly in place and can be instantly released by use of the cam and its thumb-piece. The cutter is adjusted by simply turning a thumb-screw under the bed-piece upon which the plane-iron rests. By this the cutter can be adjusted to any thickness of shaving. The Stanley Rule and Level Co., 55 Chambers Street, New York, warrant these planes to be of the best stock and finish. The various numbers and sizes of these planes which we offer give carpenters, mechanics, and others desiring them, an opportunity to get a complete set of either the wood or iron planes as premiums. The smooth planes, of which we offer two sizes, are 5½ inches long, 1¾ inch cutter; and 8 inches long, 1¾ inch cutter.

| | | | | | |
|---|---|---|---|---|---|
| Jack plane.. | .....14 | in. long, 2 | in. cutter. | } | Iron. |
| Fore " | .....18 | " " 2⅜ | " " | | |
| Jointer " | .....22 | " " 2⅜ | " " | | |

In the wood planes the lengths and widths of cutter embrace all sizes made. Forty-four subscribers at $ .50 each, or 141 subscribers at $1 each, will get a complete set of the wood-planes. Sixty-nine subscribers at $1.50 will get a complete set of the iron planes, which will last a life-time. If larger sizes than those given are wanted, a few extra subscriptions will be required, according to the difference in the price.

**Nos. 54-76—Machinists' Tools.**—This series of premiums, consisting of machinists' tools, etc., has been selected and put up at the suggestion of several practical men with whom we have consulted in regard to the subject. These gentlemen, who have a practical knowledge of the tools, and of the requirements of all who have any thing to do with the working of metals, give their unqualified approval of the tools we have selected. This list of premiums has been made so extensive that every man who has any industrial operations to carry on will find some tool or tools absolutely necessary to him. By sending us clubs of subscribers to THE MANUFACTURER AND BUILDER these tools may be obtained by the smallest possible amount of labor. Of the qualities of these tools, in point of finish, we know them to be the best in the market—the best, without challenge. When a man has a set of any of them in his tool-chest, he knows he has the means of producing work equal to any that can be done. We obtain these tools from the general agents, Messrs. POST & GODDARD, 109 Liberty Street, New York.

**No. 77—Foot-Lathe No. 1.**—Of these useful articles we offer two kinds. No. 1 is perfectly adapted for most kinds of turning in wood or metals; also drilling, boring, polishing, sawing, etc. It seems to be the size desired by most people. This is proved by the great numbers of them sold. This lathe takes a piece between centres 19 inches long and 6¼ inches wide in diameter. It weighs 200 pounds. It is fitted with two pointed centres, one spur-centre, face-plate turned and polished, two rests, one 9 and the other three inches long; also centre key and wrench combined, which fits the screw heads in different parts of the lathe. The balance-wheel weighs 45 pounds, is turned true, and is polished. It has two sizes for change of speed. This size of lathe has a great many extra parts made for it, so that whenever they are wanted they can be obtained. This is a very valuable point, as in buying other machines of the kinds only such things as happen to fit can be used, and they are not always to be found when wanted. The Rev. JOHN TODD, D.D., speaking of lathes, says in regard to these, "For price, for finish, for beauty and workmanship, I have never seen any American lathe so desirable. Of the No. 1 he says: "Nobody can own the lathe without daily gratitude." We procure these lathes through Mr. LUCIUS W. POND, 98 Liberty street, the well-known manufacturer of machinists' tools. Few people can obtain one of these lathes more easily than by obtaining 65 subscribers for THE MANUFACTURER AND BUILDER, for which we ship this premium, without any additional charge for boxing. The regular price is $50. We include leather belt 8 feet long, which costs 90 cents in the price given in the table.

**No. 78—Foot-Lathe, No. 2.**—Our subscribers are frequently asking for second-hand lathes, saying at the same time that such a one would answer their purpose, and probably come cheaper. There are many others who do not care for so complete a lathe as No. 1. The No. 2, we think, will answer this demand. It is made of cheaper materials, but in the same style as lathe No. 1. The frame is of wood, with curved legs, which give it a neat and attractive appearance. It is painted and ornamented in the best style. The bed is made with iron slides three feet long. Will take a piece between centres 21 inchhes long and 6¼ inches in diameter. It has an iron pulley like No. 1. The spindle runs accurately. The face-plate takes off, and the centres are fitted to tapering sockets. Tailstock spindle traverses with a left-hand screw. Everything is well fitted and finished. The balance-whee is the same pattern as for lathe No. 1, and is turned true. The lathe, with face-plate, long and short T rests, two pointed centres, spur-centre, and wrench, packed for transportation, costs $30. For this we also include the leather belt, 8 feet long, which is used on the driving wheel. We box this lathe and deliver it on the cars for a club of 47 subscribers at $1 50 each, or 124 at $1. The twist-drills and chucks—premiums 65, 66, and 69 to 73—especially the smaller sizes, are just the things for these lathes. The chucks, No. OX, 2 and 3, cost $2 extra for fitting in the lathe. Those desiring further information in regard to the premium may send to WESTERN & Co., 37 Park Row, New York, for an illustrated pamphlet.

**No. 79—The Dollar Steam-Engine.**—This is a real working steam-engine and boiler, which runs half an hour, or until its fill of water is evaporated, by means of a small spirit-lamp, which forms a part of it. It can not explode or get out of order. A most instructive as well as entertaining toy. Sent, prepaid, for 5 subscribers at $1 50. It is manufactured by COLBY BROTHERS & Co.

**Nos. 80, 81, 82, 83—Compact and Powerful Portable Steam-Engine and Boiler.**—BAXTER'S patent is acknowledged by many experienced engineers to be the most perfect combination, of standard principles exclusively, and thorough workmanship, ever made in a portable engine. At the same time such is its compactness and the scale and system on which it is manufactured, (by the Colt Armory, at Hartford, Ct.,) that it is afforded at the lowest price ever known for the same (actual) power. It is made by machine tools constructed expressly for it, of standard interchangeable parts throughout, like the celebrated American watches. Consequently we are able to make it one of our most attractive and valuable premiums. Besides, it is warranted to consume less fuel per horse-power than any other engine. This is in consequence, partly, of the improved arrangement of the boiler and the cylinder being entirely let into the steam-space, to save room and heat. The one-horse engine and boiler (which, like the others, will run above, not below rated power) stands but five feet high, over all, by two feet in diameter. This is premium No. 80, costs $300, and can be had for 320 subscribers at $1 50 each, or 1125 at $1 each. The five-horse engine and boiler stands 6¼ feet high by 3 feet in diameter, costs $800, and can be had for 858 subscribers at $1 50 each. The ten-horse engine costs $1200, and will run a good sized manufactory. There is now no reason why any body should be without a first-class steam-engine, especially as these engines are so simple, snug, safe, and economical of fuel that they can be run in any apartment by the fire required to warm it, and by and person of common intelligence, and will be received from the factory in perfect readiness for use. For running small lathes, drills, etc., circular and scroll saws, printing-presses, corn-huskers, cider-mills, fanning-mills, feed-mills, cotton-gins and hullers, cheese-presses, churns, pumps, washing-machines, sewing-machines, rotary blowers for forges and other purposes, etc., the smallest of these engines will be found thoroughly effective, and as little incumbrance and trouble as a kitchen stove. For business, however, we recommend to try for one of ample rather than of bare sufficiency.

**Nos. 84, 85, and 86—Steam-Pumps.**—These steam-pumps are of the best class and quality, economical in the use of steam, and capable of being applied in various ways. No. 84 is one of Hardick's manufacture, which took the first prize at the Fair of the American Institute a year ago. Nos. 85 and 86 are two sizes of the celebrated Cameron pump. Nos. 1 and 2. The first has a steam cylinder 4½ by 7 inches, and its capacity of ordinary speed is 15 gallons per minute, and costs $150. Size No. 2 has a steam cylinder 6 inches in diameter, with 8-inch stroke. It costs $200, and is capable at ordinary speed of delivering 30 gallons of water per minute. These pumps are remarkable for their compactness, simplicity, and durability. The valves are large and not liable to become choked up. By simply removing the bonnet, access can be had to them for inspection or repair,

**Nos. 105 to 108—To Procure a Patent without Money.**—We have met with many having valuable inventions, which inventors are anxious to get patented, but are unable to afford the expense, and consequently fail to secure the profits which a patent might produce. To such as are in this position, we make the following liberal offer: No. 108—We will prepare an application for a patent, attend to its passage through the Patent Office, and pay all government fees and incidental expenses attending the same, for any inventor presenting a patentable invention, who will get up a club of seventy-five subscribers for THE MANUFACTURER AND BUILDER for one year at $1,50 each, or 250 at $1 each, and send us the money by post-office order. If this application should be rejected, they may send us an additional list of thirty subscribers at $1.50 each, and the subscription money for the same, on receipt of which we will prepare and prosecute a second application, paying all government fees and incidental expenses. No. 107—For a list of fifty subscribers at $1.50 each, or 150 at $1 each, with the cash accompanying it, we will prepare an application, attend to its passage through the office, and pay the government fee ($15), the applicant paying the second government fee of $20. No. 106—For a list of thirty-five subscribers at $1.50, sent in the same way, we will prepare and prosecute an application, the applicant paying the government fee. No. 105—for twenty-eight subscribers at $1.50 each, or eighty at $1 each, we will prepare and file a caveat, furnish the necessary drawings, (which we also furnish in all the above cases), and pay all government fees. All cases placed in our hands under these arrangements will receive our best attention, equally with those for which our fees have been paid in cash, and will be appealed to the Board of Examiners-in-Chief if necessary, the applicant paying the government fee of $10 on such appeal. If the inventor has no model to accompany his application, he may procure additional subscribers, the premium on which (see cash rates) will enable him to pay for the model. A club of 100 names has been obtained in a single establishment where from 150 to 200 hands are employed. A village of 500 inhabitants will take this number readily.

**No. 129—Sewing Machines.—Your choice! A $65 machine for 65 subscribers, at $1.50 each.**—It makes no difference to us which machine we send, or whether it is selected at first or at the last moment. No charge for boxing the machines; they go safely as freight. For circulars, giving full particulars in regard to style of machines, fixtures, etc., as well as instructions, send to **Grover & Baker Manufacturing Co.**, 495 Broadway, New York; **Florence Sewing Machine Co.**, 505 Broadway, New York; **Wilcox & Gibbs Sewing Machine Co.**, 658 Broadway, New York; **Singer Sewing Machine Co.**, 458 Broadway, New York.

**Nos. 137, 138—Volumes of the Manufacturer and Builder.**—The unbound volumes of THE MANUFACTURER AND BUILDER consist of a set of numbers for a year, each separate in its own paper cover. These volumes amount to a valuable Library on all matters pertaining to the Industrial Arts, and contain more varied information on manufacturing, building, and mechanical subjects than can be obtained in books costing three times as much. The price of the volumes unbound is $1.50 each, at the office, or $1.75 if sent by mail, as they must be post-paid. They are profusely illustrated, the engravings used in them having alone cost thousands of dollars. For ordinary use, the sets of numbers unbound will answer quite well.

**Nos. 139, 140—Bound Volumes of the Manufacturer and Builder.**—*New* subscribers almost invariably desire to secure the back numbers of THE MANUFACTURER AND BUILDER from its commencement. Some desire them bound in our uniform style, while others prefer to get the loose numbers and have them bound to suit their own tastes. *Our* binding is very neat, and being done in large quantities at one time, is furnished at a *very cheap* rate. It is moreover very handsome, being of cloth, with gilt title and back, sides embossed and ornamented with a neat architectural device stamped in gold. The price of the volumes is $2.50 each, sent post-paid.

**No. 141—Covers for Binding the Manufacturer and Builder.**—These are described in premium 139, 140. Now ready for 1869 and 1870. Be careful to state *which year* you require. Any country binder will insert the year's numbers in one of these covers at a moderate cost. Price, 50 cents; sent, *post-paid*, on receipt of three subscribers at $1,50 for each cover.

**Nos. 142 to 154—Good Libraries.**—In these premiums we offer a choice of books for manufacturers, mechanics, artisans, builders and others. The person entitled to any one of the premiums 142 to 153, may select any books desired from the list published in our Special Premium Sheet, to the amount of the premiums, and the books will be forwarded, post or express paid. $25 or $50 worth of books pertaining to the industrial arts will give the boys new ideas, set them to thinking and observing, and thus enable them to make their heads help their hands. Any good book will, in the end, be of far more value to a youth than to have an extra hundred dollars on coming to manhood. ☞ Let the mechanics of a neighborhood unite their efforts, and through these premiums get an industrial library for general use.

**No. 154—General Book Premium.**—Any one sending twenty-five or more names may select books from our list to the amount of ten cents for each subscriber sent at $1; or thirty cents for each name sent at $1.20; or sixty cents for each name at $1.50. *This offer is only for clubs of twenty-five or more. The books will be sent by mail or express, prepaid through by us.*

**SPECIMEN COPIES, CIRCULARS, SHOW BILLS, etc.,**

will be furnished free of charge in sufficient quantities to meet the reasonable requirements of agents. We would respectfully request that they do not waste them, but distribute them judiciously. If some unexpected event should prevent them from continuing the business, they will do the square thing by us by giving their outfit to some friend, who will continue the business where they have left off; and who will no doubt be grateful for the opportunity of receiving profitable employment.

**Postage.**

Every subscriber pays his own postage at the office where he receives the paper. This is only twenty-four cents per year, or six cents per quarter, payable in advance.

**Don't Give up Your Town**

until everybody has been supplied with a circular and has had a chance to subscribe; and be sure that you leave your address, so that they may know where to find you in case they should make up their minds to take the magazine after you have left them. Make all drafts, money-orders, and registered letters payable to the order of Western & Company, publishers, and address all communications

**WESTERN & COMPANY, Publishers,**
NO. 37 PARK ROW, NEW YORK.

## TABLE OF CASH PREMIUMS For 1871.

**EVERY MAN HIS OWN PAYMASTER.**

STEADY EMPLOYMENT AND GOOD PAY.

| | | | PREMIUMS. At $1 50 each. | At $1 00 each |
|---|---|---|---|---|
| For every club of | 4 | subscribers..... | $1 00 | |
| " " " | 10 | " ..... | 3 00 | |
| " " " | 15 | " ..... | 6 00 | |
| " " " | 20 | " ..... | 10 00 | |
| " " " | 30 | " ..... | 16 50 | $1 50 |
| " " " | 40 | " ..... | 24 00 | 4 00 |
| " " " | 50 | " ..... | 32 50 | 7 50 |
| " " " | 75 | " ..... | 48 75 | 11 25 |
| " " " | 100 | " ..... | 65 00 | 15 00 |
| " " " | 200 | " ..... | 140 00 | 40 0 |
| " " " | 500 | " ..... | 350 00 | 100 00 |
| " " " | 1000 | " ..... | 700 00 | 200 00 |

**INTERMEDIATE CLUBS.**

It often happens that clubs are made up of numbers that are not found in the above table. Names may be added to clubs at the following rates:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| In clubs of | 4 | and less than | 10.. | $1 25 | for each name. | | |
| " " | 10 | " " | 15.. | 1 20 | " " | | |
| " " | 15 | " " | 20.. | 1 10 | " " | | |
| " " | 20 | " " | 30.. | 1 00 | " " | | |
| " " | 30 | " " | 40.. | 95 | " " | | |
| " " | 40 | " " | 50.. | 90 | " " | | |
| " " | 50 | " " | 200.. | 85 | " " | | |
| " " | 200 | " " | 500.. | 80 | " " | | |
| " " | 500 | " " | 1000.. | 80 | " " | | |
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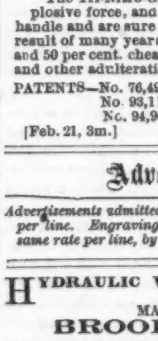

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PATENTS—No. 76,499, April 7, 1868.. No. 96,465, Nov. 2, 1869.
No. 93,113, July 20, 1869 No. 106,606, Aug. 23, 1870. Address GEORGE N. MOWBRAY,
No. 94,969, Sept. 21, 1869 No. 106,607, Aug. 23, 1870. NORTH ADAMS, MASS.

[Feb. 21, 3m.]

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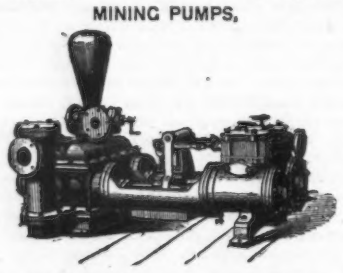

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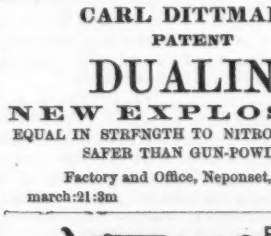

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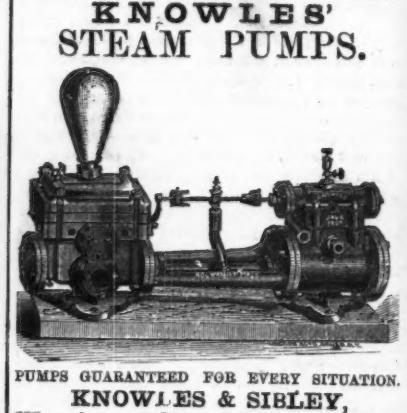

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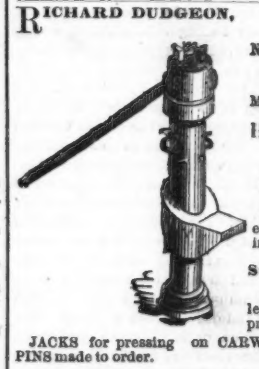

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